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ROYAL BOTANIC GARDENS, KEW.

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HAEMATOSTAPHIS, Hook. f.

Haematostaphis Barteri, *Hook. f.*; Fl. Trop. Afr. I. p. 443.

Ill.—Trans. Linn. Soc. xxiii. t. 25.

Vernac. name.—Dzinjerigya (Nupe, *Barter*).—Blood Plum.

Nupe.

The fruit is edible, acid, and not unpleasant; it is of a deep crimson colour and hangs in clusters like bunches of grapes (Trans. Linn. Soc. xxiii. 1860, p. 169).

ODINA, Roxb.

Odina acida, *Rich.*; Fl. Trop. Afr. I. p. 446.

Ill.—Volkens, in Notizblatt, App. xxii. No. 3, 1910, p. 106, f. 54 (*Lannea acida*); Engl. & Drude, Veg. Erde, ix. p. 805 (*L. acida*).

Found in Upper and Lower Guinea.

Fruit edible. According to Vogel the powdered bark mixed with other substances is used by the natives to form a paint for the face (Hooker, Niger Flora, *Odina Oghigee*, p. 286). Leaves, root, and bark used for various medicinal purposes in Senegal (Sebiré, Pl. Util. Sénégal, p. 78).

A decoction of the bark of *Odina antiscorbutica* is used in Angola as a remedy for scorbutic ulcers of the mouth, and for scurvy; cultivated in the vicinity of the villages in Angola, and favours the virgin forests in the hilly districts (Hiern, Cat. Welw. Afr. Pl. i. p. 178).

SPONDIAS, Linn.

Spondias lutea, *Linn.*; Fl. Trop. Afr. I. p. 448.

Vernac. names.—Kafili (Katagum, *Dalziel*, No. 338 Herb. Kew); Iyeye (Lagos, *Dawodu*); Buaji (Sierra Leone, *Scott Elliot*); Muguenga (Golungo Alto, *Welwitsch*).—Hog Plum; Yellow Spanish Plum Jamaica, *Marsh*).

Throughout Upper Guinea. Indigenous to the West Indies and Tropical America.

The fruit is edible, with an agreeable acid taste; cultivated in Jamaica for feeding swine (Moloney, For. W. Afr. p. 305). An infusion of the fruit is good for fever (Sébiré, Pl. Util. Sénégal, p. 78).

The bark is stated to be used for tanning in British Guiana (Moloney, l.c.).

In Antioquoia silkworms are fed on the leaves (Paton, Mus. Kew).

Spondias mangifera, *Willd.* Sp. Pl. ii. p. 751.

A small tree, everywhere glabrous. Leaves 1–1½ ft.; petiole slender; leaflets 2–9 by 1–4 in., shortly petiolulate, shining, more or less oblique; nerves 10–30 on each side, horizontal, joined by a strong intra-marginal one. Panicles large, spreading, sparingly branched. Flowers ¼ in. diam., scattered uni- or bi-sexual Calyx 5-toothed. Petals oblong, greenish-white. Disk broad, 10-toothed. Filaments short, subulate. Drupe 1½–2 in. long, yellow, smooth; flesh very austere; stone cavernous, usually with 1 (1–3) perfect seed (Fl. Br. India, ii. 1879, p. 42).

Ill.—Rheede, Hort. Mal. i. t. 50; Wight, Illust. t. 76; Bedd. Fl Sylv. t. 169.

(16583—6a.) Wt. 6298—573. 500. 12/11. D & S. A

Vernac. name.—Jungli Amba (India, *Dymock*).—Hog Plum.

Fruit eaten when ripe; preserved; eaten in curries, and pickled when unripe.

The tree yields a gum similar to gum-arabic.

Wood soft, of no value; weight 29–30 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 223).

It grows well in the Botanical Gardens, Old Calabar (Williams, 1909). It grows in dry forests in many parts of India and Burma, also in mixed forests in Burma up to 3000 feet, and in the moist low country of Ceylon, often planted (Gamble, l.c.).

CONNARACEAE.

BYRSOCARPUS, Schum. & Thonn.

Byrsocarpus coccineus, *Schum. & Thonn.*; Fl. Trop. Afr. I. p. 452.

Vernac. names.—Ado (Lagos, *Rowland*); Orikoteni (Lagos *MacGregor*).

Lagos; Lokoja; Zungeru; Kontagora; Nupe.

Used medicinally (MacGregor, Herb. Kew).

Growing in open grassy lands, Kontagora, &c. (Dalziel, Herb. Kew), in Nupe, as a small shrub 5 ft. high, flowers white; seeds bright scarlet when the pod first opens (Barter, Herb. Kew).

CONNARUS, Linn.

Connarus africanus, *Lam.*; Fl. Trop. Afr. I. p. 457.

Ill.—Cav. Diss. t. 221; Ann. Fac. Sc. Marseille, vi. 1897, fasc. 2, t. 1.

Vernac. name.—Séribéli or Séri-gbéli (Sousou, W. C. Africa, *Heckel*).

Lagos.

In Sierra Leone, the seeds, pounded and made into flour, are used as a purge (Scott Elliott, Herb. Kew).

A drug, the native name of which means red medicine. In Conakry and the greater part of French Guinea the seeds are employed, but in Bramaya the root-bark is used. According to Drs. Maclaud and Drevon the drug is given in doses of 25 to 60 grams, administered in the form of a decoction or infusion. It is stated to be a very efficient taenifuge (Year Book Pharm. 1896, p. 134, from Pharm. Journ. [4] ii. p. 243). Employed as an anthelmintic on the West Coast of Africa (Heckel & Schlagdenhauffen, Ann. Fac. Sc. Marseille, vi. 1897, fasc. 2, p. 1).

Ref.—"Sur le Connarus africanus, Lam." Étude botanique, chimique et thérapeutique, Heckel & Schlagdenhauffen, in Annales de la Faculté des Sciences de Marseille, vi. fasc. 2, 1897, pp. 1–26.

CNESTIS, Juss.

Cnestis corniculata, *Lam.*; Fl. Trop. Afr. I. p. 461.

Ill.—De Rochebrune, Toxic. Afric. ii. fasc. 1, p. 116, f. 105.

Vernac. names.—Oboqui (Gaboon, *De Rochebrune*); Furudugu (Sierra Leone, *Smythe*).

There are no specimens at Kew to prove the existence of this plant in Nigeria, although it is known from Senegambia, Sierra Leone, and the Gaboon.

The leaves are said to contain the same principles as those of

Agelaea Lamarckii, Planch., of which it is stated that an infusion is a powerful astringent, and which used in excess causes severe dysentery. They are also much used as a cure for blennorrhoea, being taken in the form of a diet-drink. The hairs of the fruit are irritant in somewhat the same manner as those of certain Mucunas (De Rochebrune, l.c. pp. 112, 117).

Ref.—"Cnestis corniculata, Lam.," in Toxicologie Africaine, De Rochebrune, ii. Fasc. 1, 1898, pp. 115–122 (Octave Doin, Paris, 1898), Historique, Chimie, Physiologie et Thérapeutique.

Cnestis ferruginea, *DC.*; Fl. Trop. Afr. I. p. 461.

Ill.—Engl. & Prantl, Pflan. iii. pt. 3, f. 37, A—D.

Vernac. names. — Ekoro (Yoruba, *Millson*); Esise (Lagos, *Dawodu*); Gboyingboyin (Oloke-Meji, *Hislop*).

Lagos; Yoruba; Onitsha; Lokoja; Old Calabar, and widely distributed in West Africa.

A decoction of the leaves is used as a laxative in Yoruba (Millson, Kew Bull. 1891, p. 217). The fruit is very bitter, and is used by the natives of Sierra Leone for cleaning their teeth (Scott Elliot, Herb. Kew).

A handsome bush, bearing clusters of red fruit and white flowers at the same time (Millson, l.c.). Found growing, 12 feet high, at Onitsha (Barter, Herb. Kew); on the slopes of Mount Patti, Lokoja (Elliott, Herb. Kew); in bush, under shade, and in open spaces near the seashore, Victoria, Cameroons (Kalbreyer, Herb. Kew); as an evergreen shrub, 4–6 ft. high, in Golungo Alto (Welwitsch, in Hiern. Cat. Welw. Afr. Pl. i. p. 190); Apasam, Gold Coast, about 700 ft. (Johnson, Herb. Kew).

The order Connaraceae is comparatively unimportant economically. In addition to the above-mentioned species, there are some fruits in the Museum at Kew called "Sabongo," collected by Welwitsch in Golungo Alto; they no doubt belong to this order, probably to *Byrsocarpus* (*Rourea*) *venulosa*, Hiern, but the only description given of the uses (*see* Hiern Cat. Welw. Afr. Pl. i. p. 186) seems to apply more correctly to *Xylopia aethiopica*, the fruits of which also bear the same native name in Angola. Fruits from S. Nigeria resembling the "Sabongo" (Connaraceae) of Welwitsch were sent to Kew, by Messrs Alex. Miller Bros. in 1902.

The "Kitsongo" (*Byrsocarpus* (*Rourea*) *orientalis*) of Madagascar is described in an extensive paper by Prof. L. Courchet, Annales L'Inst. Col. Marseille, v. 2nd series 1907, pp. 67–135, f. 14, and the only wood in the order known to be of any value, is "Zebra Wood" (*Connarus guianensis*, Lam.), an ornamental, hard wood, used for inlaying.

LEGUMINOSAE—PAPILIONACEAE.

CYTISUS, *Linn.*

Cytisus proliferus, *Linn. f.* Suppl. (1781), p. 328.

A large bush or tree 8–10 ft. high; branches slender. Leaves drooping, ternate, on short petioles; leaflets oval lanceolate, pointed at both ends, and clothed on the under side by copious, silky adpressed hairs, generally white but in some cases fulvous or of a rich brown colour. Flowers silky in bud, snow white when fully expanded, attached in loosely packed umbels on the sides of the branches; pedicels rosy in colour. Pods slightly narrowed at the base, sinuous oblong pointed, and densely pilose in the young state; produced abundantly (Kew Bull. 1893, p. 115).

Ill.—Ventenat, Descr. Pl. Nouv. Cultiv. Cels, t. 13; Bot. Reg. (1816) t. 121; Bot. Mag. t. 1908; Lodd. Bot. Cab. t. 761.

Vernac. name.—Escabon (Teneriffe, *Perez*). Silky Cytisus.

There are several forms of this species differing slightly in the size of the leaves and the colour of the flowers. None of them however possess any special merit as fodder plants, and the Escabon itself is seldom browsed upon by animals unless pressed by hunger (Kew Bull. l.c. p. 115).

Var. **palmensis**, *Christ*, Bot. Jahrb. IX. p. 120.

This variety differs from the type by its more robust growth, and a laxer habit. It often attains a height of 12–15 ft. in good soils, and all parts of the stem and branches are enveloped in leaves. Its very leafy character is one of the marked features of the plant. The leaflets are ovate-oblong somewhat obtuse and dark-green in colour. The young growths are almost destitute of the silky hairs so abundant on the species (Kew Bull. 1893, p. 116).

Vernac. name.—Tagasaste (Canary Islands, *Perez*).

This plant is especially useful as a fodder. It may be cut two or three times a year, and 35 lbs. of freshly chopped leafy branches mixed with 20 lb. of chopped straw is said to be sufficient for the daily nourishment of a horse or cow (Kew Bull. 1891, p. 239).

Seeds were distributed by the Royal Gardens, Kew, in 1879 to various Colonial Governments, and very satisfactory reports were received from South Australia, Ootacamund, Madras; Cape Colony, Natal, &c.

There is no record of any similar attempt to introduce the plant to Nigeria, except that it was recommended by Kew (1892) to a correspondent for cultivation in dry situations in the Colony of Lagos, and that seeds were purchased by the Lagos Government in 1892, from Messrs. Vilmorm Andrieux & Co., Paris, they germinated freely, it is recorded, but eventually damped off (Millen, Report Bot. St. Lagos, 30th Sept. 1892); no other reports are available. There seems to be little doubt, however, in view of its importance as a fodder that the plant is worthy of experimental cultivation at some of the inland stations. The single attempt to establish the plant does not appear to have been a fair one and a trial should be made in the drier regions or in the high lands of Nigeria.

The plant will not stand frost, but it will probably bear considerable heat, and may therefore prove suitable for tropical and subtropical countries with a friable soil (l.c. 1893, p. 116).

Propagation may be effected by seed or by cuttings. The seeds are slow in germinating. A light dry soil and a warm climate are the main requirements. Each plant should be placed 6 to 10 ft. apart. After the second or third year the plants may be lopped two or three times a year, continuing for from 10 to 20 years (l.c. p. 239). No irrigation is required and the plant can be grown in comparatively barren land up to 4000 ft. above sea level (l.c. p. 242).

Ref.—"Tagasaste" (*Cytisus proliferus*, Linn. var.) Kew Bull. 1891, pp. 239–244. — Le Tagasaste, *Cytisus proliferus* varietas, Pérez & Sagot, pp. 1–38 (Paris 1892).—"Tagasaste (*Cytisus proliferus*, Linn. var. *palmensis*, Christ) Kew Bull. 1893, pp. 115–117.

CROTALARIA, Linn.

Crotalaria falcata, *Vahl.*; Fl. Trop. Afr. II. p. 40.
Lagos; Niger.
Stem yields a fibre (Rowland).

Crotalaria glauca, *Willd.*; Fl. Trop. Afr. II. p. 12.
Katagum.

The people (in the region 3° N. lat.) eat the flowers, pods and leaves (Grant, Trans. Linn. Soc. xxix. 1872, p. 51); eaten according to Speke and Grant by the people of Madi as spinach (Moloney, For. W. Afr. p. 307).

Found growing in fields Katagum (Dalziel, Herb. Kew); in sandy thickets, Pungo Andongo (Hiern, Cat. Welw. Afr. Pl. i. p. 195); in grass about three feet high, on laterite, Sierra Leone (Scott Elliot, Herb. Kew); at 6000 ft., Elmentebba, Sierra Leone (*idem*, l.c.); and at 4000 ft. Manganja Highlands, Zambesi (Kirk, Herb. Kew).

Crotalaria juncea, *Linn.* Sp. Pl. (1753), p. 714.

A stiff shrub several feet high, with slender virgate rigid thinly silky branches. Leaves rather distant, firm, linear or oblong, usually 1½–3 in., shining on both sides with thin short brown silky hairs. Racemes loosely 12–20-flowered, reaching a foot long; bracts minute, linear. Calyx ½–¾ in. long, densely clothed with ferruginous velvety hairs; teeth linear-lanceolate, very deep. Corolla bright yellow, glabrous, slightly exserted. Pod 1-1¼ in. long, clothed with short, spreading, persistent, silky hairs, 10–15-seeded (Fl. Br. India, ii. p. 79)

Ill.—Rheede, Hort. Mal. ix. t. 26; Trew, Pl. Select. Ehret. t. 47; Rumpf, Amb. v. t. 96, f. 1; Roxb. Pl. Corom. ii. t. 193; Bot. Mag. t. 490; Andr. Rep. vi. t. 422; Duthie, Field Crops, t. 21; Tropenpflanzer, 1902, p. 515; Bot. Mag. t. 1933 (*C. fenestrata*).

East Indian Hemp; San, Sani, Sanai, or Sunn Hemp; Tag Hemp (India); Indian (Bombay or Salsette, Travancore, Jabbalpur) Hemp, False Hemp, Brown Hemp, Agra Hemp (Ide & Christie Mus. Kew); Sontag (Berar, India Office, Mus. Kew); Rushy stalked Crotalaria (Andrews, Rep. l.c.); Channel'd stalked Crotalaria (Bot. Mag. t. 490); Window calyxed Crotalaria (Bot. Mag. t. 1933).

Introduced to Lagos Botanic Station, seeds being sent from Kew in 1888. Commonly cultivated in India.

Found in Ceylon and Burma, and distributed to Malaya and Australia.

The fibre of this plant is strong and durable. The uses to which it may be put are the same as those of true hemp (*Cannabis sativa, q.v.*), and to a large extent those of Ambari Hemp (*Hibiscus cannabinus, q.v.*)—cables, ropes, twine, sacking, paper pulp, &c.

According to Watt (Comm. Prod. India, p. 436) the most important use of San Hemp in India is for making fishing nets, for which purpose the cordage is carefully tanned. The manufacture of fishing nets forms the subject of a special article in the Agric. Ledger (*see refs.*).

The fibre is used for a similar purpose in Ceylon (Thwaites, Mus. Kew).

In Madras the fibre is wound round the axles of locomotive carriages, and oil poured over it, to reduce friction (Subba Rao, Bull. No. 59, 1908, Dept. Agric. Madras, p. 12).

Other uses to which various parts of the plant are put in India are: the stripped stalks for fuel, torches (Tinnevelly), matches (by the Bohoras in the Bombay Presidency), and thatching—the bare stalks for the latter purpose, in the Tinnevelly district, often being taken in lieu of wages for extracting the fibre ; the flowers are cooked as curry, and the seed for feeding buffaloes (Subba Rao, l.c.) ; the seeds are given to cattle, and also the plant, which is found to be very nourishing, causing cows to give a larger supply of milk (Journ. Soc. Arts, xli. 1893, p. 791). The composition of *Crotalaria juncea*, as a fodder is given by Leather, in Agric. Ledger, No. 7, 1903 p. 165.

India is the chief and probably the only source of the commercial supply. Watt distinguishes four grades :—

1. Rajpore or Dugaguddi—Bombay Country Hemp ; it is about 4 ft. long and fetches Rs. 16 to Rs. 18 per cwt. 2. Jabbalpur, value Rs. 11 to Rs. 13 per cwt. 3. Phillibit. 4. Bengal. The exports, he states, are chiefly in the most inferior stuff (Comm. Prod. India, p. 435).

In 1895 London brokers considered that the only difficulty in pushing the trade in Sunn Hemp was the inability to procure a uniform and large enough supply (Morris, Journ. Soc. Arts, xliii. 1895, p. 906).

Up to 1896 the material was only exported to a small extent. A sample 3 ft. long, from Burma examined at the Imperial Institute was at the time (1896) said to be readily saleable on the London market at from £15 to £16 per ton (Tech. Rep. & Sci. Papers, Imp. Inst. 1903, p. 70).

It is difficult to obtain statistics of the commerce in this class of fibre, owing to the application of the term "Hemp," and some uncertainty attaches to returns from a country where it is well known that several kinds of hemp—quite distinct botanically—are grown. But, assuming as it is generally believed that all "East India Hemp" is derived from the species under consideration, the following figures may be taken as being reliable.

HEMP—EAST INDIA—SUNN.

——	Dec. 15th, 1909.	Jan. 15th, 1910.
Bengal	Slow spot 18*s.* to 24*s.* New crop quotations far over what buyers will pay.	Dull, 19*s.* to 24*s.*
Benares	13*s.* 6*d.* wanted for shipment, buyers stick at 13*s.*	Sellers 13*s.* 6*d.*; buyers 13*s.*
Allahabad ...	Several old spot lots have been cleared out from 6*s.* 3*d.* to 11*s.* New crop neither offers nor is wanted; quality spoken of as poor.	No enquiry.
Bombay	Stocks large and demand limited, new crop for shipment quoted.	Flat.
Jubblepore ...	Fine 17*s.* 6*d.*; No. 1, 15*s.* 6*d.*; No. 2, 16*s.* 6*d.*	As last quoted, dressed kinds in better request, 16*s.* to 19*s.*
Etarsi & Sewnee ...	Fine 19*s.*	
Dewghuddy ...	Fine 19*s.* 6*d.*; No. 1, 17*s.* 6*d.*; No. 2, 16*s.* 6*d.*; No. 3, 15*s.*	
Gulburga	Fine 17*s.*; No. 1, 16*s.*	
Calcutta	Dressed, in small supply 19*s.* to 20*s.*	Dressed, selling, at slight improvement 19*s.* 6*d.* to 20*s.* 6*d.*
Madras.		
Gopaulpore	20*s.*	No sales to report.
Godavery	17*s.* to 20*s.*	in free supply, but selling steadily, 18*s.* 3*d.* to 19*s.* 6*d.*
Coconada	18*s.*	16*s.* 9*d.* to 17*s.* 6*d.*
Palinara	No. quotation	15*s.* 3*d.*
Tows	12*s.* 6*d.* to 13*s.*	Slow, 11*s.* to 13*s.* 6*d.*

The total amount of fibre imported during 1909 was 6453 tons (Mon. Circs. Ide & Christie, Dec. 15th, 1909, and Jan. 15th, 1910), and the average for the past 10 years (1900–1909) is 5309 tons (Mon. Circs. *idem*, Jan. 1905 and Jan. 1910).

Under cultivation for fibre Sunn Hemp requires a light, poor, or at the best, a moderately rich soil, with free drainage. Clay, according to Wisset & Watt, is not suitable, but according to Roxburgh strong clay soils suit it best. The secret of soil, perhaps, lies in the fact that the plant does not like stagnation at the roots, and will not, like jute, grow on inundated lands; clay soils, well worked, may suit it in a dry climate, but where a heavy rainfall occurs they would appear to be quite impossible. A light sandy soil, according to Duthie & Fuller (Field Crops, p. 83), gives the tallest plants. Rich soils tend to the production of coarse fibre. Soil is of secondary consideration when the plant is grown as a green manure.

The seed may be sown broadcast on land well prepared by ploughing and harrowing. It should be sown thickly in order to prevent branching and to save weeding.

The amount required per acre may vary—70 to 120 lbs. (Watt); one maund [about 82 lbs.] in N.W. Provinces and Oudh (Duthie & Fuller); 70 Madras measures [245 lbs.] in Tinnevelly; 20 to 30 seers [40 to 60 lbs.] in the Godaveri and Kistna deltas (Subba Rao); 80 to 125 lbs. (Spon's Encyc. p. 946). The seed is remarkable for germinating quickly; according to Duthie & Fuller (l.c.) the seedlings show above ground 24 hours after being sown.

The plants, for full development, require to be placed about 3 or 4 in. apart, and once the field is established, little or no care is required. They grow to a height of 6–10 ft., possibly higher, and come to maturity in 3 or 4 months.

Opinions vary somewhat as to the right time to cut for fibre—usually when in flower (Watt); while in flower if the fibre is for fine purposes, and when in seed or when the seed is ripe if strength is desired (Spon's Encyc. l.c.); the finest, strongest, and best fibre may possibly be got from plants which are not dead ripe, but very good fibre is got from a ripe crop (Mollison). In all parts of the Madras Presidency, except the Godaveri and Kistna deltas, the crop is cut after the seed is ripe (Subba Rao).

It has been stated that in this country a particular shade of colour is desirable to admit of mixture with Russian Hemp (*Cannabis sativa*) (Watt, Comm. Prod. India, p. 435); this would in all probability also depend largely on the retting.

In the Godaveri and Kistna deltas about 2 feet of the branched tops are cut off before the plants are reaped, and used as fodder (Subba Rao). The same practice is general in the N.W. Provinces and Oudh, the tops being cut when the plants are in full flower (Duthie & Fuller, l.c.).

Harvesting, retting, and preparation in general is much the same as for Jute (*Corchorus capsularis*, *q.v.*).

The washing is somewhat more laborious. In India an expert washer, it is stated, can turn out 7–8 seers [14 to 16 lbs.] in three hours, and about 15 seers [30 lbs.] in a day, which equals the outturn of 5–6 maunds [410–492 lbs.] of plants. The fibre, after washing, in the N.W. Provinces and Oudh, is cleaned or drawn, and a woman can treat by hand 8 to 10 seers [16 to 20 lbs.] of fibre daily (Duthie & Fuller, Field Crops, i. p. 84).

The yield per acre has been given at 520 lbs. (Mollison); 640 lbs.

(Mukerji); 8 maunds [650 lbs.] (Duthie & Fuller); about 700 lbs. (Spon's Encyc. p. 946); ranging from 150 lbs. to 1200, but estimated on an average at 640 lbs. (Journ. Soc. Arts, xli. 1893, p. 791).

Whether results comparable with those experienced in India are to be attained in W. Africa or not, the plant can be recommended for growing, amongst other crops, cocoa, coffee, rubber, &c., as a green manure, or cover to prevent weeds. In India, when used for green manure, the plants are usually uprooted, when two to two-and-a-half months old, and ploughed in. It is for this purpose considered preferable to one or two maunds [82–164 lbs.] of oil-cake per acre (Watt, Comm. Prod. India, p. 433).

Ref.—Treatise on Hemp, with observations on the Sunn plant of India, which may be introduced as a substitute for many of the purposes to which hemp is now exclusively applied, Wissett, pp. 1–296 (London, 1808).——"Crotalaria juncea—Sunn Hemp" in Spon's Encycl. Industr. Arts, Div. iii. 1881, pp. 946–947.——"Crotalaria juncea" in Field and Garden Crops, N.W. Provinces and Oudh, Duthie & Fuller, i. pp. 82–85.——"Crotalaria juncea" in Report on Indian Fibres and Fibrous Substances, exhibited at the Colonial and Indian Exhibition, 1886, Watt, pp. 28–30.——"Crotalaria juncea" in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 595–613.——"Production of Jute and San Fibre in India," Journ. Soc. Arts, xli. 1893, pp. 789–791.——"Sunn Hemp," Morris, l.c. xliii. 1895, p. 906, with photo-micrograph of transverse section of fibre. "Sunn Hemp Fibre," in Agric. Ledger, No. 11, 1896, pp. 1–3.——"Crotalaria juncea," in Descr. Cat. Useful Fib. Pl. of the World, Dodge, U.S. Dept. Agric. Fib. Investigations, Rep. No. 9, 1897, pp. 139–142.——"Kultur und Verwendung von Sunnhanf in Indien," Dr. Schulte im Hofe, in Der Tropenpflanzer, 1902, pp. 513–516.——"Crotalaria juncea, Sunn Hemp Fibre," "The Fishing Nets of the Kolis of Bandra, Bombay," Ribeiro, in Agric. Ledger No. 7, 1905, pp. 117–120.——"The San-Hemp Plant" in Comm. Prod. India, Watt, pp. 430–437.——Sunn Hemp (Crotalaria juncea), Subba Rao, Bulletin No. 59, 1908, Dept. of Agric. Madras, pp. 1–16.——"Sann Hemp, Ambari, and Agave as Fibre Crops in the Central Provinces and Berar," Clouston, in Agric. Journ. India, 1908, pp. 144–151.——"Culture du Crotalaria dans l'Inde, Subba Rao, in Journ. D'Agric. Tropicale, 1909, pp. 176–178.——"*Crotalaria juncea*" in "Note on the Extension of Cultivation of Fibre Plants in India," Bull. No. 15, July 1909, Agric. Research Inst. Pusa, pp. 5–7.——*Ibid.* in Agric. Journ. India, 1909, pp. 347–350.——Papers on San Hemp in the Pabna District, Pal, Chunder, Ferguson and Dunstan, in Agric. Ledger, No. 7, 1908–9, pp. 131–146.——"On Two Varieties of Sann," Howard & Howard, Mem. Dept. Agric. India, iii. 1910, pp. 177–189.

Crotalaria retusa, *Linn.*; Fl. Trop. Afr. II. p. 13.

Ill.—Bot. Reg. (1817) t. 253; Bot. Mag. t. 2561.

Vernac. names.—Koropo or Skeken-Sheken-Omoda (Oloke-Meji, *Foster*).—Wedge leaved, or Wedge leaved East Indian Crotalaria.

Abeokuta, Oloke-Meji. Has also been collected in Sierra Leone, Gaboon, Zanzibar and Persia. Common in the East Indies and Malaya, extending to Australia.

Yields a fibre used in the manufacture of cordage, canvas &c., often cultivated in India for its fibre which is sold as a form of Sunn Hemp (Dict. Econ. Prod. India).

The root rubbed and mixed with wine is said to be a specific for colic and flatulency; the juice from the leaves is used as a drink in fevers, said to purify the blood, and a decoction is used in cases of chronic fever (Moloney, For. W. Afr. p. 307). The juice of the leaves and tender stalks is prescribed in India, by the Tamool doctors in cases of scabies and impetigo (Dymock, Pharmacog. Indica. i. p. 400 and Dict. Econ. Prod. India).

Found growing 2-3 ft. high in a cultivated patch of Henna (*Lawsonia alba*) in S. Persia, altitude 1500 ft. (James, Herb. Kew); on waste ground about 200 ft. above sea level, Freetown, Sierra Leone (Johnston, Herb. Kew); in sandy rocky situations on the Victoria River, and Sea Range, Andrew's Land, N. Australia (Bentham Fl. Austral. ii. p. 181). For particulars of cultivation *see C. juncea.*

Crotalaria striata, *DC.*; Fl. Trop. Afr. II. p. 38.

Ill.—Andrews, Rep. t. 648 (*C. Saltiana*); Rchb. Ic. Bot. Exot. t. 232 (*C. Brownei*); Bot. Mag. t. 3200; Wright, Cocoa, p. 173.

Vernac. name.—Biye-rama (Katagum, *Dalziel*).

Jeba; Katagum. Found in the Malay Islands, and spread through Tropical America and Africa.

Cultivated by the Santals, Chutia Nagpur, India, mainly for its fibre (Dict. Econ. Prod. India).

The plant is useful as a green manure in cocoa, coffee, rubber plantations, &c.

The composition of the plant in the fresh state has been given by Wright (Cocoa, p. 173) as follows:—Nitrogen per cent. 0·7 to 1·0; Potash per cent. 0·47; Phosphoric acid, per cent. 0·154; Lime per cent. 0·210. It is recommended to be buried with lime or basic slag around the trees (l.c.). The nitrogen content of the plant in the green state has also been recorded as 0·73 to 0·99 per cent., and a crop of 14,000 lbs. is considered equivalent, so far as nitrogen is concerned to 1700 lbs. of castor cake, or 700 lbs. of sodium nitrate (Bull. Imp. Inst. 1906, p. 124).

The time between sowing and uprooting has been given at 10 months (Wright l.c.); twice a year (Bull. Imp. Inst. l.c.). The right time to bury the plants in, however, will depend largely on local conditions, it is important to see that they are not left growing so long as to become woody. Cultivated on some tea plots at Peradeniya, Ceylon, it was found that plants sown in July, and pruned or uprooted after 4 months growth yielded 3061 lbs. of original matter; 5 months, 10,128 lbs.; 9 months, 7054 lbs., and after 14 months, 583 lbs.; or a total of 20,826 lbs. (Ceylon Adm. Rep. Roy. Bot. Gardens, 1905, p. C 30).

Crotalaria verrucosa, *Linn.*; Fl. Trop. Afr. II. p. 14.

Ill.—Rheede, Hort. Mal. ix. t. 29; Burman, Thes. Zeylan. t. 34; Jacq. Ic. Pl. Rar. t. 144 (*C. coerulea*); Cav. Ic. iv. t. 321 (*C. angulosa*); Andrews, Rep. v. t. 308; Bot. Reg. (1828), t. 1137; Bot. Mag. t. 3034; Wight, Ic. Pl. Ind. or. i. t. 200; Paxton, Mag. xiii. t. 223; Annales de Gand, iii. 1847, t. 118; Banks & Solander, Bot. Cook's Voy. i. t. 52.

Vernac. name.—Nilandana hiriya (Ceylon, *Mus. Kew*).—Warted Crotalaria.

Found in Tropical Africa, Asia and America, uses as under *C. retusa.*

MEDICAGO, Linn.

Medicago sativa, *Linn.*, Sp. Pl. (1753), p. 778.

Stems stout, erect, 1–2 ft. high, hollow, cylindrical with raised lines. Leaves stalked; leaflets elliptical-oblanceolate, $\frac{1}{2}$–$1\frac{1}{4}$ in. long, denticulate towards the apex, the central one inserted on the common petiole above the others. Stipules lanceolate-subulate. Flowers $\frac{1}{2}$ in. long, bluish-purple, more rarely yellowish, in axillary stalked racemose heads, which are from $\frac{3}{4}$–$1\frac{1}{2}$ in. long. Pedicels shorter than the calyx. Calyx with the teeth triangular-subulate, nearly equal, longer than the tube. Standard longer than the calyx-teeth, and exceeding the wings and keel. Mature pod rupturing the calyx, olive-brown, forming a helix of about $\frac{1}{4}$ in. in diameter, and generally making about $2\frac{1}{2}$ turns, pubescent with adpressed hairs and faintly reticulated. Seeds yellowish-brown, rectangular-oval, smooth, dim, with a deep depression at the hilum. Plant bright green, with scattered adpressed pubescence (Syme, English Botany, iii. (1864) p. 22).

There are several forms. The var. *turkestanica* is so-called to distinguish the alfalfa found in Russian Turkestan and Central Asia (*see* Hansen, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 150, 1909, p. 18). Peruvian Alfalfa has been described by Brand (l.c. Bull. No. 118, 1907, p. 23) as *Medicago sativa*, Linn; var. *polia*. It can be distinguished by "the pubescence which covers the whole plant, somewhat sparsely at the base, but becoming increasingly dense in ascending, until at the top the plants are densely covered with minute downy hairs." A field of the common form is of a typical vivid green, while the Peruvian variety has a silvery grayish-green, due not only to the hairiness of the plants, but also in part to the fact that the veins of the leaves are almost white (l.c. p. 20).

"Variegated Alfalfa" has been defined by Westgate to comprise the progeny of the intermediate hybrid form of the ordinary alfalfa *M. sativa*, with the hardy yellow-flowered alfalfas, *M. falcata* and its allies of Eurasia (Westgate, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 169, 1910, p. 12). The widely varying forms under this designation do not readily admit of botanical distinction.

Ill.—Parkinson, Theat. p. 1114, f. 1; Martyn, Fl. Rustica, t. 48; Schuhkr. Handb. t. 212a; Rousseau, La Botanique, t. 17; Lam. Encycl. t. 612; Sowerby & Smith, English Bot. xxv. t. 1749; Baxter, Brit. Bot. v. t. 329; Icon. Pl. Fl. Danicae, xiii. t. 2244; Syme, English Bot. iii. t. 334; U.S. Dept. Agric. Rep. Bot. 1881–1882, t. 25; Clavaud, Fl. Gironde, t. 10; f. 2A; Pammel, U.S. Dept. Agric. Div. Agrost. Bull. No. 9, 1897, p. 16; Fairchild, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 23, 1902, t. 10 (roots compared with those of Berseem—*Trifolium alexandrinum*); Rchb. Ic. Fl. Germ. t. 2111; Cycl. Amer. Agric. ii. t. 5, and ff. 271–282; Brand, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 118, 1907, t. 3 (Peruvian Alfalfa); Agric. Journ. India, 1909, tt. 33–35; Westgate, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 169, 1910, t. 1.

Vernac. names.—Alfalfa; Lucerne; Provence Lucerne; Arabian, Persian, Turkestan, Siberian and Guaranda (Ecuador) Alfalfa or Lucerne; Oasis Alfalfa; Purple Lucerne; Burgundy Trefoil; Horned Clover; Cultivated Medick.

Probably native of Western Asia. Cultivated under established conditions in Europe, Asia, Africa, America, and Australia. In Europe, largely in Spain and the Mediterranean region. In Asia, from Siberia, through Turkestan to India and Burma, China, &c. In North and South Africa, and in America from Canada, through all the United States, Mexico, Ecuador, Peru, Chili, Argentine Republic, &c. In Egypt it is cultivated on a small scale as a hot season crop—"Berseem" (*Trifolium alexandrinum*), an annual legume is the principal forage crop in this country. Under experiment in Uganda, the West Indies, Philippine Islands, Hawaiian Islands, and other tropical countries, including arid, semi-arid, and wet regions.

The chief use of alfalfa is as a fodder for cattle, horses, sheep, pigs and poultry. It may be used green, as hay, ensilage, ground into meal, or as pasture. When fed in the cut green state or as pasture, stock—especially cattle and sheep, require care, and only a limited amount should be allowed at one time.

The hay may be baled or stacked for convenience in feeding or for export. Ensilage of this crop is not often necessary, as it is usually grown under dry conditions or under irrigation, and it is moreover not recommended for silos.

The meal is the whole of the dried stems and leaves ground up, which, when mixed with grain or molasses, makes a good feed. The Lucerne Products Co., Omaha, Nebraska, have erected a large warehouse and a mill for grinding the plant, and the meal there is in great demand by stock-raisers and feeders (Cons. Rep. Ann. No. 3622, 1906, p. 88).

For manuring it is valuable used in a green state, but it would be more profitable to first feed it to stock. When the time comes to dispense with an established area the plants can be ploughed under for this purpose.

The flowers are good for feeding bees.

In view of the wide distribution, the climatic conditions obviously admit of variation, although it is generally agreed that a dry climate having a rainfall of about 20 to 25 in., and possibly to 50 is the most suitable and under certain conditions of soil and temperature, indispensable. The extremes for the cultivation of alfalfa in Ecuador are given as between 1600 metres and 3200 metres above sea-level, with an average temperature of 15° C. [59° F.] (Dietrich, U.S. Cons. Rep. Nov. 1907, p. 174).

Soil is also of the first importance—it should be of unusual depth, well drained, open, rich, and calcareous. The depth to which the roots penetrate is remarkable; ten or more feet is usual, but an instance is recorded of a root going down to a depth of 129 ft. through soil and rock (known to miners as "rotten porphyry") in Nevada (Queensland Agric. Journ. vii. 1900, p. 489; from Alfalfa, where and how to grow it, by Chas. W. Irish).

The subsoil therefore is of equal importance, and the duration of the crop will depend very largely on its nature. It should be naturally calcareous, well drained, and the general physical condition similar to that near the surface.

According to investigations made at the California Experiment Station, on the relation of alfalfa to alkali soil, it was found that the tolerance of salt solutions in the soil by young alfalfa plants is about 1200 lbs. of sodium carbonate, 750 lbs. of sodium chloride, and 1200 lbs. of sodium sulphate, per acre, for the upper 2 ft. Well established plants are able to withstand a much larger proportion of mineral salts, and they will thrive with the alkali, or at least the excess of it kept below 5 or 6 ft., by proper irrigation (Hitchcock, U.S. Dept. Agric. Farmers' Bull. No. 215, 1905, p. 13).

It has been found, as the result of more than 100 experiments at the New York State Agricultural Experiment Station, that the chances of raising a good crop are four in five where lime (13½ cwt. to the acre) and naturally inoculated soil (about 2 cwt. to the acre) are applied (Agric. News, Barbados, viii. 1909, p. 281).

Farm yard manure or some commercial fertilizer, superphosphate of lime, sulphate of potash &c., are necessary on poor soil, before sowing, and at intervals during growth, applied after a harvest.

Propagation may be effected by seeds or cuttings of strong shoots from established plants.

Seeds may be sown broadcast or on ridges (1½–2½ ft. apart) preferably the latter, to facilitate cultivation, irrigation, and to prevent water lodging about the plant. About 10 to 20 lbs. per acre may be required. Sometimes a thinly sown nurse crop of some annual grain is recommended, but if this can be avoided so much the better, weeds and cover of any kind being detrimental.

A crop takes about six months to establish, and will stand cutting over for many years, and to be profitable, it would require to be kept growing for three years, at the least.

Harvesting should be made just before the plants flower; when cut for hay the preparation requires some care in order to avoid shedding of the leaves.

The number of cuttings and yield per year will vary according to locality. In India 10 cuttings with an out-turn per acre of 31,816 lbs. (Watt. Comm. Prod. India, p. 779) In Ecuador from 5–7 crops in the table-lands, and scarcely 3 crops at very high altitudes (2800 metres or more); sometimes reaching 120,000 lbs. per hectare (2·471 acres) in rich soil; normal yield 80,000 lbs. per year (Dietrich U.S. Cons. Rep. Washington, Nov. 1907, p. 174). In Honolulu under irrigation 13 crops per annum (Smith, Philippine Agric. Rev. 1908, p. 244). In Nebraska cut at least three times a year, and yielding 4·12 tons per acre (Cons. Rep. Ann. No. 3622, 1906, p. 10), the area covered (1905) being 315,711 acres yielding 1,301,760 tons, value £2,343,168 (l.c. p. 88).

Other instances could be given, but the above will be sufficient to show an approximation of the average yield. It may be taken as a general rule that in countries where there is no winter season and hence a longer growing period, the yield will be greater than when growth is quite suspended for several months in the year.

The experience in Nigeria with this plant is scarcely worthy of mention; there is a record of the purchase of some seeds of the Provence Lucerne, from Vilmorin Andrieux & Co., Paris, by the Lagos Government in 1892; "grown freely" is all that is said in the report (Millen, Bot. St. Lagos, 30th Sept. 1892). In 1906 the cultivation of Lucerne was reported from Oloke Meji, for distribution as a rotation and fodder crop (Foster, S. Nigeria, Govt. Gaz. Dec. 11th, 1907, Suppl. p. 14, and Col. Rep. Misc. No. 51, 1908, p. 43). It seems possible, however, that this important crop may be found to succeed in the interior of Nigeria, more particularly on the higher elevations, and towards the extreme north.

Ref.—"*Medicago sativa*," in Dict. Econ. Prod. India, v. pp. 199–203.——*Medicago sativa*, Lucern, Mollison, Agric. Ledger, No. 18, 1893, pp. 1–3.——Lucerne (Alfalfa) Cultivation, Agric. Ledger, No. 5, 1894, pp. 1–3; extract from Handbook of Experiment Station Work, U.S. Dept. Agric. 1893, pp. 10–11.——Alfalfa or Lucern, Smith, U.S. Dept. Agric. Farmers' Bulletin, No. 31, 1895, pp. 1–23.——"*Medicago* *sativa* (Lucerne)" in Permanent and Temporary Pastures, Sutton, pp. 83–85 (Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London, 1895).——"Notes on Lucerne," Meaden, Proc. Agric. Soc. Trinidad, ii. 1896, pp. 86–89.——Alfalfa (*Medicago sativa*), in Notes on the Grasses and Forage Plants of Iowa, Nebraska and Colorado, Pammel, U.S. Dept. Agric. Div. of Agrost. Bull. No. 9, 1897, pp. 16–17.——"Value of Lucerne as a Fodder Crop," Journ. Bd. Agric. iv. Sept. 1897, pp. 218–221.——Turkestan Alfalfa, Lamson—Scribner, U.S. Dept. Agric. Div. of Agrost. Circ. No. 25, 1900, pp. 1–20.——"Turkestan Alfalfa (*Medicago sativa* var. *turkestanica*)" in Co-operative Experiments with Grasses and Forage Plants, Kennedy, U.S. Dept. Agric. Div. of Agrost. Bull. No. 22. 1900, pp. 58–64.——"Oasis Alfalfa (*Medicago sativa*)," l.c. pp. 64–65——"Irrigating Lucerne," Mahon, Queensland Agric. Journ. xii. 1903, pp. 319–321. ——"Lucerne Growing," Lamb, l.c. xiii. 1903, pp. 191–193; Preparation of the land, sowing, harvesting, grazing, yield, &c.——Alfalfa or Lucern, its Culture, Use and Value, Grisdale, Shutt & Fletcher, Dept. Agric. Ottawa, Canada, Bull. No. 46, June 1904, pp. 1–19.——Alfalfa Seed, Brown, U.S. Dept. Agric. Farmers' Bulletin, No. 194, 1904, pp. 1–13, illustrated.——"Lucerne," Transvaal Agric. Journ. ii. 1904, pp. 278–280.——"Lucerne (*Medicago sativa*)," Rep. Agrostologist and Botanist, Transv. Dept. Agric. 1904–5, pp. 243–245.——Alfalfa Growing, Hitchcock, U.S. Dept. Agric. Farmers' Bulletin No. 215, 1905, pp. 1–39, illustrated.——"Alfalfa or Lucern" in Algeria, Means, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 80, 1905, pp. 79–83.——"Lucerne Seed," Stewart-Galbraith, Dept. of Agric. Orange River Colony, second Ann. Rep. 1905–6, pp. 312–320, with analyses of 47 samples of the purity and vitality, and two plates of weed seeds present in Lucerne.——"Alfalfa or Lucerne," in Dip. and Cons. Rep. Ann. No. 3622, 1906, pp. 10–11.——The Book of Alfalfa, History, Cultivation and Merits; Its Uses as a Forage and Fertilizer, Coburn, pp. i–xi + 1–336, with numerous illustrations (The Orange Judd Co., New York, 1906).——"Lucerne, *Medicago sativa*," Westgate, in Cycl. American Agric. ii. pp. 192–197 (The Macmillan Co., New York, and Macmillan & Co., London, 1907).——Peruvian Alfalfa, a new long season variety for the South West, Brand, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 118, 1907, pp. 1–35, pls. i.–iii.——"Alfalfa in Ecuador," Dietrich, U.S. Cons. Rep. Washington, Nov. 1907, pp. 174–175.——"Alfalfa Seed Growing," in France, Skinner, l.c. May 1908, pp. 103–104.——"The Botanical History and Classification of Alfalfa," Scofield, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 131, 1908, pt. 2, pp. 11–19, illustrated.——An Improved Method of Separating Buckhorn (*Plantago lanceolata*) from Red Clover and Alfalfa seeds, Shaw, U.S. Dept. Agric. Bureau of Pl. Industry, Circ. No. 2, 1908, pp. 1–12, illustrated.——Alfalfa, Westgate, U.S. Dept. Agric. Farmers' Bulletin No. 339, 1908, pp. 1–48.——"*Medicago sativa*," in Comm. Prod. India, Watt, pp. 778–779.——Alfalfa or Lucerne, Zavitz, Ontario Dept. Agric. Bull. No. 165, 1908, pp. 1–15.——Alfalfa in Cultivated Rows for Seed Production in Semi-arid Regions, Brand & Westgate, U.S. Dept. Agric. Bureau of Pl. Industry, Circ. No. 24, 1909, pp. 1–23; figs. 1–3. Abstract in Agric. News, Barbados, 1909, p. 389.——"Lucerne Growing," Queensland Agric. Journ. xxii. 1909, pp. 55–58.——The Wild Alfalfas and Clovers of Siberia, with a Perspective View of the Alfalfas of the World, Hansen, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 150, 1909, pp. 1–31; *Medicago sativa*, pp. 16–18; with map.——

Money in Lucerne; the last word in Alfalfa Culture, by South African Experts and practical Farmers, pp. 1–88 (Midland Printing and Publishing Co., Ltd., Cradock, Cape Colony, 1909 ?).——"Lucerne or Alfalfa Cultivation," Thompstone, in Agric. Journ. India, iv. Oct. 1909, pp. 319–334, illustrated.——Irrigation of Alfalfa, Fortier, U.S. Dept. Agric. Farmers' Bulletin, No. 373, 1909, pp. 1–48, illustrated. ——Variegated Alfalfa, Westgate, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 169, 1910, pp. 1–63, illustrated, 5 figures in the text; plates i.–ix.

INDIGOFERA, Linn.

Indigofera arrecta, *Hochst.*; Fl. Trop. Afr. II. p. 97.

[*I. umbonata*, Welw. Fl. Trop. Afr. ii. p. 98.]

Ill.—Wood, Natal Pl. iii. t. 287; Whyte, Report, Africa No. 3, 1903.

Vernac. names.—Degendeg or Dek Indig (Abyssinia, *Oliver*, *Prain & Baker*); Sense (Ilorin, *Bailey*): Sense (Lagos, *MacGregor*); Bwenga (Karonga, Nyassa, *Scott*); Um—Pegembetu (Natal, *Wood*)—Java Indigo; Natal Indigo.

Bassa Province (Elliott, No. 86, 1904, Herb. Kew); Katagum (Dalziel, Herb. Kew).

The chief Indigo producing species in Africa outside the area occupied by *I. articulata*; largely cultivated in Java (Prain & Baker, Journ. Bot. xl. 1902, p. 144) to which place it was introduced from Natal (Wood, Natal Pl. iii. pt. 4, p. 18). Used in Ilorin for dyeing purposes (Bailey, Herb. Kew), by the natives in Natal for staining blue (l.c.), by the natives of Pungo Andongo for dyeing cloth (Hiern, Cat. Welw. Afr. Pl. i. p. 216) and yields good Indigo in Shupanga (Kirk, Herb. Kew).

This plant as a source of Indigo was recommended, by the Director of the Royal Botanic Gardens, Kew, to the Government of S. Nigeria in preference to *Indigofera tinctoria*, when requisitioning for a supply of seed (Kew to Colonial Office, 30th March, 1905). Java Indigo (*I. arrecta*) has proved so suitable to the soil and climate of Behar, that, roughly speaking, the risks of cultivation have been halved, and the production of the green plant doubled without a depreciation of the dye content of the leaf (Pharm. Journ. [4] xxv. p. 492); or, according to Coventry, the Java plant shows an increase of 35 per cent. in the amount of green plant cut per acre, and of 45 per cent. increase in vat produce over the ordinary plant of the United Provinces (Watt, Comm. Prod. India, p. 661).

The average prices per lb. for Java Indigo, in 1909 at Amsterdam, were for "very fine red" 5*s.* 3*d* to 5*s.* 4*d.*; "very fine violet" 4*s.* 11*d.* to 5*s.*; "medium fine to fine," 4*s.* 5*d.* to 4*s.* 9*d.*; "low medium," 3*s.* 10*d.* to 4*s.* 2*d.*; "ordinary to good ordinary," 3*s.* 4*d.* to 3*s.* 8*d.* (Cons. Rep. Ann. No. 4415, 1910, p. 10).

The total imports to the Netherlands were 5515 lb. (1905); 2281 lb. (1906); 3647 lb. (1907); 2918 lb. (1908); 1533 lb. (1909) (l.c. p. 11).

Leaves said to be used as a vegetable in Nyasaland (Scott, Herb. Kew).

Found at an altitude of 4–5000 ft. Kilimanjaro, (Johnston, Herb. Kew); 3500–6000 ft. Kibwesi to Matschakas, Ruwenzori (Scott Elliot, Herb. Kew). Frequent in sandy thickets between Condo & Quisondo (Hiern, Cat. Welw. Afr. Pl. i. p. 216).

For general cultural details see *I. tinctoria.*

Some difficulty, however, is met with in the germination of the seed, due to the hard testa or outer-coat. In Behar specially constructed machines have been used for scratching the seeds to admit of the penetration of moisture. This treatment has been considered satisfactory, but somewhat difficult of application, owing to the fine adjustment of the machine required to produce good results.

Another method consists in treating the seed with strong sulphuric acid. The process is as follows :—" The seed to be treated is placed in a large water-tight wooden vessel, and undiluted commercial sulphuric acid is poured over it and it is stirred with a wooden or iron instrument until every seed is wet ; it is then left for the action to proceed for exactly half an hour. At the end of this time, a large quantity of clean cold water is rapidly poured on to the seed, which is thoroughly stirred meanwhile. The seed is then allowed to settle to the bottom of the vessel and the water poured off. A fresh supply of clean water is then added, and the seed thoroughly washed and the water poured off as before. This is repeated a third time, after which the seed should be free from acid. It is then spread out in the sun to dry and is ready for sowing. The proportions of substances used for the treatment, which should be strictly adhered to are :—Seed, ½ maund (about 41 lbs.) ; Acid, 5 seers (10¼ lbs.) ; Water, 20 gallons for each washing. It is not recommended to treat more than half a maund of seed at a time. The method has the advantages that all bad, hollow seed and other impurities float up, and may be poured off during the washing operations, and the appearance of the seed is very considerably improved. It is not advisable to keep treated seed through the rains, unless it is put into sealed tins, as it is liable to deteriorate " (Agric. Journ. India, i. July, 1906, p. 262).

Ref.—" On Testing Indigo ; with notes on a yellow compound found in Java Indigo, Rawson " reprint from Journ. Soc. Chem. Industry, 31st March, 1899, pp. 1–8 (Eyre & Spottiswoode, London, 1899). ——" On the occurrence of Hard Seed in *Indigofera arrecta*," Leake in Journ. Roy. Hort. Soc. xxix. 1904–05, pp. 65–67.——" The Germination of Java Indigo Seed," Agric. Journ. India, i. July, 1906, pp. 262–263.——" Indigo Seed Selection," l.c. ii. July, 1907, pp. 296–297.——"*Indigofera arrecta*," in Comm. Prod. India, Watt, p. 661.

Indigofera diphylla, *Vent.*; Fl. Trop. Afr. II. p. 74.

Ill.—Ventenat, Choix Pl. Jardin de Cels, Paris, t. 30.

Katagum (Dalziel No. 30, 1907, Herb. Kew).

Used as a dye by the natives in Senegambia (Moloney, For. W. Afr. p. 311).

Indigofera endecaphylla, *Jacq.*; Fl. Trop. Afr. II. p. 96.

Ill.—Jacq. Ic. iii. t. 570 ; Pal. de Beauv. Fl. Ow. Benin, ii. t. 84 ; Bot. Reg. (1824), t. 789.

Eleven-leaved Guinea Indigo (Bot. Reg. l.c.).

Lagos : Ebute Metta (Millen, No. 19, Herb. Kew) ; found also in Senegambia, Gold Coast, Dahomey, St. Thomas, Angola, Zambesi, Natal and the Cape.

Believed to be the plant used by the natives of Oware and Benin to colour the calico for their principal garment—pagne or cotton drawers (Bot. Reg. l.c.; Moloney, For. W. Afr. p. 310, from Palisot de Beauv. l.c. p. 44).

Indigofera hirsuta, *Linn.* ; Fl. Trop. Afr. II. p. 88.

Ill.—Rheede, Hort. Mal. ix. t. 30 ; Burman, Thes. Zeyl. t. 14 ; Lam. Encycl. t. 626 ; Jacq. Ic. iii. t. 569 ; Pal. de Beauv. Fl. Ow. Ben. ii. t. 119 ; Hook. Comp. Bot. Mag. ii. 1836, t. 24.

Vernac. name.—Idogo (Lagos, *Punch*).

Nupe (Barter, Nos. 1594, 1631, Herb. Kew); Lagos (Punch and Dawodu, No. 8, 1899, Herb. Kew) ; Epa-Ile (Cons. of Forests, S. Nigeria, No. 462, Herb. Kew) ; Quorra (E. Vogel, Herb. Kew).

Said to yield Indigo in West Africa (Moloney, For. W. Afr. p. 310, from Spon's Encycl. p. 858).

Indigofera pulchra, *Vahl.* ; Fl. Trop. Afr. II. p. 76.

Vernac. name.—" Baki-Bunu " (Katagum, *Dalziel*).

N. Nigeria (Elliott, No. 127, Herb. Kew); Katagum (Dalziel, No. 21, 1907, Herb. Kew).

Used with grass in thatching, Katagum (Dalziel, l.c.).

Indigofera simplicifolia, *Lam.* ; Fl. Trop. Afr. II. p. 72.

Katagum (Dalziel, No. 26, 1907, Herb. Kew).

Root an ingredient in Fulani Arrow-poison (Dalziel, l.c.).

Indigofera suffruticosa, *Mill.* Gard. Dict. ed. viii. (1768) No. 2.

[*Indigofera Anil*, Linn.; Fl. Trop. Afr. ii. p. 98.]

Ill.—Sloane, Hist. Jamaica, t. 179, f. 2 ; Dict. Sc. Nat. t. 252 ; Tuss. Ant. ii. t. 9 ; Lam. Encyc. t. 626, f. 2 ; Ralph, Ic. Carp. t. 40, f. 1 (pod and seeds) ; Bot. Mag. t. 6506 (figured from plant flowered at Kew) ; Köhler, Med. Pflan. iii.

Vernac. names.—[Añilis (Guam), Añil (Spanish) ; Tagum (Philippines) *Safford*] ; Juiquilite (Mexico, *Dering*).

Quorra (Vogel No. 128, Herb. Kew). Native of S. America ; and cultivated in Burma, China, &c.

One of the species most commonly cultivated (Fl. Trop. Afr. l.c.). Cultivated in small quantities near the dwellings of the natives, Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 192) ; and on the Gambia almost to the exclusion of *I. tinctoria* (Williams, Mus. Kew). Widely cultivated in Sierra Leone, where the process of obtaining the dye is a somewhat primitive one. The young branches are gathered and left in heaps in the sun, until decomposition sets in ; they are then boiled in a large vessel, afterwards cooled and the cloth placed in the liquid together with pieces of a certain root (? as a mordant) (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 31).

In French Guiana the bruised leaves are used as an anodyne in warm baths ; in decoction (Erysipele) as a powerful sudorific, and the roots and seeds infused in rum for destroying vermin (Heckel, Pl. Med. et Toxiq. Guy. Franc. in Ann. Inst. Col. Marseille, iv. 1897, p. 120).

Ref.—" *Indigofera Anil*," in Med. Pflanzen, Köhler, Vol. iii. 6 pages.—" The Indigo of Mexico " in report on the cultivation of Cacao, Vanilla, India-Rubber, Indigo, and Bananas in Mexico, Foreign Office Rep. Misc. No. 385, 1895, pp. 18–23.

Indigofera tinctoria, *Linn.*; Fl. Trop. Afr. II. p. 99.

Ill.—Rheede, Hort. Mal. i. t. 54 (Ameri); Plant. Indig. et Exot. Ic. t. 30 ; Plenck, Ic. vi. t. 572 ; Wight, Ic. Pl. Ind. Or. ii. t. 365 ; Berg & Schmidt, Darst. Beschr. Pharm. iv. t. 30d ; Bentley & Trimen, Med. Pl. t. 72 ; Duthie, Field Crops, t. 12 ; Zippel, Ausl. Handels, Nährpfl. t. 31 ; Engl. & Prantl. Pflan. iii. pt. 3, f. 115 A—D.

Vernac. names.—Nyakampete (Senna, *Kirk*) ; Nil (India, *Prain & Baker*) ; [Añilis (Guam.), Añil (Spanish), Tagum (Philippines) *Safford*].—Indigo.

Jeba (Barter, Herb. Kew); Kuka (E. Vogel, No. 18, Herb. Kew); Katagum (Dalziel, Herb. Kew).

Yields a large percentage of the Indigo dye of commerce. The plant is also suitable for green manuring. Medicinally it has been used as a remedy in epilepsy, infantile convulsions, chorea, hysteria, and amenorrhœa (Bentley & Trimen, Med. Pl. 72).

Cultivated for commercial purposes chiefly in India—Bengal, Madras, Bombay, Sind, &c.—and to some extent in the Straits Settlements, British Honduras, Philippine Islands, Central America, Colombia, and for local use in many tropical countries, including probably the whole of Tropical Africa.

One of the products cultivated throughout N. Nigeria (Elliott, Col. Rep. Ann. No. 476, 1905, p. 132).

Nowhere cultivated in the neighbourhood of Kuka, but everywhere wild in great quantity, and yields the dye with which the natives near Kuka dye their cotton goods (Vogel, No. 18, Herb. Kew, named *I. orthocarpa*, Baker, in Fl. Trop. Afr. ii. p. 99).

In the Hausa countries, N. Nigeria, a species of Indigo—which probably belongs here—is grown on the same ridges as guinea corn; used locally for dyeing purposes (Dudgeon, N. Nigeria, Gaz. 31st July, 1909, p. 159). The plant was grown experimentally at Abutshi by the Royal Niger Co., in 1889 (Woodruff, Report to the Company 30th Nov. 1889).

On the Gambia, it is cultivated for the sake of the dye, used locally by the natives (Brown Lester, Kew Bull. 1892, p. 47); but no attempt has been made to extract the indigo for the European market (l.c. 1898, p. 40).

Tropical Africa is perhaps more the natural home of *Indigofera tinctoria*; but India is without doubt the home of the cultivated plant as grown for commercial purposes; and it is there grown under a great variety of conditions.

The cultivation of Indigo, like that of cotton, requires the superintendence of an expert.

The principal conditions are: a warm climate, moderate rainfall, rich deep soil—alluvium or a sandy loam; thorough tillage, manuring, ploughing, harrowing, weeding, special care taken until the plants get well established, and proximity to a good supply of water, for use in the manufacture of the dye.

With regard to manuring it has been suggested that the indican content of the leaf accompanies semi-starvation conditions (Burkill & Annett, Industr. and Agric. Chemistry, 1908-09, p. 13).

About 10 to 15 lb. of seed will be sufficient to sow an acre, broadcast, or in drills about 18 inches apart.

The seeds germinate in a few days, and the crop is ready for cutting when the flowers appear, which may be in three or more months.

It does not appear possible to determine a normal yield; the amount of plant per acre is said to fluctuate widely between 168 to 48 maunds [13,826 lbs. to 3950 lbs.], and the yield of dye per acre between 25 and 7½ lb. (Leake, *see* Comm. Prod. India, Watt, p. 680).

Another estimate has been given at 60 maunds [4938 lb.] of plant, and 10 to 20 maunds [823 lb. to 1646 lb.] of indigo per acre (Journ. Soc. Arts. xlviii. 1900, p. 840).

Grown as an annual, one cutting is obtained, or more, according to the length of the growing season. On the ratoon system, cuttings may be obtained for two or more seasons.

According to Watt (Comm. Prod. India, p. 673), cultivation reaches the highest development in certain districts of N. Behar, on estates under European management.

The land is prepared in the dry season, thoroughly ploughed, broken, levelled or "compacted," to work the soil into a finely divided state, and the general body of it into such a condition as to admit of the moisture rising by capillary attraction, in a sufficient degree, to induce germination, and subsequent growth of the young seedlings, until the commencement of the following rainy season. The seeds are sown two or three months before the rains commence, and although growth may have been somewhat slow, the plants will by this time have developed a good root system and be ready to make rapid growth. Two crops may thus be usually obtained.

The nature of the soil—an extremely fine alluvial deposit—it is stated, makes this method possible.

The manufacture or extraction of the indigo is effected by two processes: the "wet" and the "dry."

The former is the more usual method and consists briefly of steeping (the freshly cut plant), beating, boiling, filtering, pressing, cutting into cakes, drying and packing.

The "dry" process differs mainly in the fact that the freshly cut plant is dried and stripped of the leaves which after a few weeks are steeped and then treated in much the same way as in the "wet" process.

Good commercial indigo should float on water, and show a copper-like surface when rubbed. Its value in the early part of the 19th century was from about 5*s.* 6*d.* to 15*s.* per lb. The returns for 1908 show a value of about 2*s.* 6*d.* to 2*s.* 9*d.* per lb. The quantities (from British India, the most important source) have for the same periods gone down from about 9,000,000 lbs. to about 842,000 lbs.

It is generally conceded that the trade in the natural indigo, in all parts of the world has declined by reason of the advance made by the artificial indigo, discovered in 1880 by Prof. Baeyer, and made commercially available in 1890 by Prof. Heumann (*see* Kew Bull. 1910, p. 283); although local conditions may to some extent have contributed towards the degeneration of the industry.

Efforts are now being made by the Government of India to improve the situation for the planter. Rawson, Leake, Bloxam and others have been enquiring into the possibilities of improvement on scientific principles. Details of their work, together with full information on the subject generally, will be found in the following publications.

Ref.—"Indigofera tinctoria," Med. Pl. Bentley & Trimen, No. 72 (J. & A. Churchill, London, 1880).——"Indigo," in Spon's Encyclopædia, Div. iii. 1880, pp. 858–861.——Artificial Indigo, Perkin, Proc. Phil. Soc. Glasgow, xiii. 1881.——"*Indigofera tinctoria*," in Field and Garden Crops, N.W. Prov. and Oudh, Duthie & Fuller, i. pp. 43–50 (Thomason Civil Engineering College Press, Roorkee, 1882).——"Indigo," in Dict. Econ. Prod. India, Watt. iv. 1890, pp. 387–469.——"Indigo," in Agric. Bulletin, Malay Penin. May 1893, pp. 44–50.——"Indigo," Kew Bull. 1894, pp. 322–323.——"The Indigo of Mexico," *see* Dip. & Cons. Rep. Misc. No. 385, 1895, under *I. Anil*; Abstract in Journ. Soc. Arts, xliv. 1896, pp. 743–744.——

"Indigo," in Les Drogues Simples d'Origine Vegetale, Planchon & Collin, ii. pp. 502–505 (Octave Doin, Paris, 1896.)——"Artificial Indigo," Kew Bull. 1898, pp. 33–35.——Report on the Cultivation and Manufacture of Indigo in Bengal (For the Indigo Defence Association, Ltd.), Rawson, pp. 1–41 (William Byles & Sons, 1899).——"Artificial Indigo," Armstrong, Journ. Soc. Arts. xlvii. 1899, pp. 891–892.——"Memorandum on the Present Position of Natural and Artificial Indigo," Dunstan, in Tech. Rep. 1903, pp. 305–308.——"Indigo," Hooper, Appendix iii. in Ann. Rep. Indian Industr. Assn. (Calcutta 1900), pp. 37–47, including a list of 37 plants, which yield indigotin, or a body very much allied to it.——"The Indigo Industry," Armstrong, Journ. Soc. Arts, xlviii. 1900, pp. 483–484.——"Indigo Plantation," l.c. pp. 847–848; report from the "Times" Correspondent in Simla, on an important step taken to assist the Indigo Planters of Behar.——"The Cultivation, Manufacture and Uses of Indigo," Rawson, l.c. pp. 413–434.——"German Artificial Indigo *v.* Indian Indigo," Dip. & Cons. Rep. Ann. No. 2668, 1901, Trade of Marseilles for 1900, pp. 21–26; *See* Letter to the "British Indian Commerce," by E. F. Lavers, controverting certain statements made in this report; published Journ. Soc. Arts, xlix. 1901, pp. 818–819.——"The Synthesis of Indigo," Meldola, l.c. xlix. 1901, pp. 397–413.——"Natural and Artificial Indigo," l.c. p. 746.——"Notes on Indigofera," Prain & Baker, in Journ. Bot. xl. 1902, pp. 60–67 and pp. 136–144.——"Indigo," in L'Agric. pratiq. pays chauds, i. 1902, "Principaux Produits du Moyen Niger," pp. 451–471.——"Indigokultur und Fabrikation in Britisch Indien," Schulte im Hofe, in Der Tropenflanzer, vi. 1902, pp. 70–86, and pp. 128–141.——"L'Indigo dans l'Inde," Karpèles, in Journ. d'Agric. Trop. ii. 1902, pp. 229–231.——"Indigo Statistiques Commerciales, la Concurrence de l'Indigo Synthétique," l.c. pp. 22–25.——"La crise de l'Indigo Natural," l.c. iv. 1904, pp. 170–173."——"The Localization of the Indigo-Producing Substance in Indigo-Yielding Plants," Leake, in Annals of Botany, xix. 1905, pp. 297–310, with plate.——"Naturindigo und Synthetischer Indigo," in Der Tropenpflanzer, x. 1906, pp. 678–679.——"Indigo," in Philippine Agric. Rev. i. 1908, p. 316.——"The Indigo Plant," in Comm. Prod. India, Watt. pp. 660–685.——"Glucosode Process of Indigo Manufacture," Schrottky, in Agric. Journ. India, iii. 1908, pp. 290–292.——"Indigo Research," *Ibid.* l.c. pp. 74–75.——Report to the Government of India, containing an account of the Research Work on Indigo, in the University of Leeds, 1905–7, Bloxam, and others, under the general supervision of Prof. Perkin, pp. 1–117 (published by order of the Secretary of State for India, 1908); Review, "Research Work on Indigo," Barnes, in Agric. Journ. India, iv. 1909, pp. 68–83; "Recent Research on Indigo," Robinson, in Science Progress, April 1909, pp. 575–578.——"Chemistry of Indigo," &c., in Industrial and Agric. Chemistry, Burkill & Annett (Board of Scientific Advice for India, 1908–9, pp. 11–13.——Report of the Indigo Research Station at Sirseah, for 1908–9, Bergtheil, pp. 1–23 (Muzufferpur, 1909).——"Indigo," in Kew Bull. 1910, pp. 283–286.

TEPHROSIA, Pers.

Tephrosia purpurea, *Pers.*; Fl. Trop. Afr. II. p. 124.

Ill.—Rheede, Hort. Mal. i. t. 55 (*Colonil*); Bertoloni, Misc. Bot. xix. t. 5 (*I. indigofera*); Bailey & Gordon, Pois. Pl. p. 21; Banks & Solander, Bot. Cook's Voy. i. t. 62 (*Cracca purpurea* var. *longifolia*); Bailey, Pois. Pl. t. 70.

Vernac. name.—Maragua (Katagum, *Dalziel*).

Katagum; Kuka. Cosmopolitan in the Tropics.

The root is added to flavour milk in Katagum (Dalziel, Herb. Kew).

Used in native medicine in India as a deobstruent and diuretic for coughs, and as a blood purifier (Moloney, For. W. Afr. p. 311, from Dymock, Mat. Med. W. India, p. 178).

This plant is recommended for green manuring and as a cover plant in rubber plantations, &c; it is considered better adapted for planting in young clearings than *Crotalaria* (Campbell, Agric. Bull. Fed. Mal. States, viii. 1909, p. 447).

May be propagated by seeds, germinates quickly, grows freely, and covers the ground in a few months.

On some plantations in the Federated Malay States it is grown in the form of hedges at sufficient distances from each tree to allow the air to circulate freely (Agric. News, Barbados, 1909, p. 405).

When well established it can be cut over as desired, or about two or three times a year.

Ref.—"A Useful Leguminous Plant," in Agric. News, Barbados, 1908, p. 405.

Tephrosia Vogelii, *Hook. f.*; Fl. Trop. Afr. II. p. 110.

Ill.—Trans. Linn. Soc. xxix. t. 31; Ann. Inst. Col. Marseille, ix. 1902, t. 7.

Vernac. names.—Were (Lagos, *MacGregor*, *Dawodu*), Igongo (Gaboon, *Moloney*); Laye Igu (Abeokuta, *Irving*); Igun (Lagos, *Dawodu*); Igun (Oloke-Meji, *Foster*); Agba-odo (Yoruba, *Millson*); Cafoto (Golungo Alto, *Welwitsch*); Calembe (Pungo Andongo, *Welwitsch*); Kambeti (Barotseland, *Cockerell*); Tawy (Sierra Leone, *Scott Elliot*); Kassa (Gonga, *Armitage*).

Lagos; Bassa; Nupe, and throughout Tropical Africa.

Used for stupefying fish in Bassa (Elliott, Herb. Kew), Nupe (Barter, Herb. Kew), Lagos (MacGregor, Millen & Dawodu, Herb. Kew), Yoruba (Millson, Kew Bull. 1891, p. 210), Unyoro (Grant, Trans. Linn. Soc. xxix. 1872, p. 55), Sierra Leone (Scott Elliot, Herb. Kew), Angola (Welwitsch, in Hiern. Cat. Welw. Afr. Pl. i. p. 220), Barotseland (Cockerell, Mus. Kew), Gonga Country Gold Coast (Armitage, Herb. Kew), Zambesi (Buchanan, Herb. Kew), and probably for the same purpose throughout Tropical Africa.

The methods adopted are much the same everywhere. The leaves and branches are pounded and thrown on the surface of the water, causing the fish to rise to the surface stupefied or dead a few minutes afterwards. They are quite wholesome and fit for food.

The following passage gives an account of the use of "Kassa" in the Gonga Country:—

"A stretch of about half a mile of water is dammed and any alligators in it killed; the people from the neighbouring villages assemble, each bringing their bundle of "Kassa" leaves, which are beaten to a pulp, taken to the prepared stretch of water and thrown in. Men then enter the water and splash about, and in about ten minutes fish begin to appear on the surface and are collected in baskets or by hand. The largest fish are taken in this way. The skin of the men who enter the water into which the Kassa has been thrown, is affected by the latter and becomes rough, or as they say, like a stick" (Colonial Office to Kew, April 23rd, 1898. Extract from Report on Gonga Country by Inspector Armitage).

In Barotseland a decoction of the green pod, bark and leaves is used by the women as an abortive, and a similar decoction is used as a cure for skin diseases of dogs and goats (Cockerell, Mus. Kew).

May be propagated readily by seed. Cultivated for stupefying fish in Nupe (Barter, Herb. Kew), Bassa, (Elliott, Herb. Kew), the Gonga Country (Armitage, l.c.), Angola (Welwitsch, l.c.), and in Princes Island (Mann, Herb. Kew) ; also as a fence in Uganda and Unyoro (Grant, Trans. Linn. Soc. xxix. 1872, p. 55).

Found growing on the banks of the Ofun River, Lagos (Millen, (Herb. Kew), in moist rich loam, on the edges of Barotse Valley, where it grows 8 to 10 ft. high (Cockerell, l.c.).

Ref.—" Sur la toxicité des principes définis du *Tephrosia Vogelii*," Hanriot, in Comptes Rendus, cxliv. 1907, pp. 498–500.

GLIRICIDIA, Kunth.

Gliricidia maculata, *H. B. & K.*, Nov. Gen. et Sp. Pl. vi. 1823, p. 393.

A tree. Leaves alternate, imparipinnate. Leaflets petiolate, oblong, obtuse, rounded at the base, glabrous above, glaucescent below, about 1⅔ in. long. Calyx campanulate, coloured, limb scarcely denticulate, persistent. Corolla rose-coloured.

Vernac. names.—Madera or Madura (Nicaragua, *Hart*).—Nicaraguan Shade Tree ; Madura Shade Tree.

Grown as a permanent shade tree for Cacao (*Theobroma Cacao*) in Nicaragua, Trinidad, the West Indian Islands, &c. Recommended for this purpose in Nigeria (*see* p. 98).

Cultivated in Old Calabar streets as a shade tree (Williams, Rep. Bot. Gdn. Old Calabar, 1908).

May be propagated by seeds or cuttings, and grows quickly ; the prunings necessary to regulate the shade make a good mulch, rich in nitrogenous matter.

The flowers have been found at the Trinidad Government Laboratory to contain from 2·4 to 3·36 per cent. of nitrogen (Agric. News, Barbados, 1909, p. 168).

SESBANIA, Pers.

Sesbania aculeata, *Pers.* ; Fl. Trop. Afr. II. p. 134.

Ill.—Banks and Solander, Bot. Cook's Voy. i. t. 63.

Vernac. names.—Amureji (Lagos, *MacGregor*).—Dhunchee Hemp.

Katagum ; Jeba ; Lagos ; and widely distributed in Tropical Africa, Asia, and Australia.

Yields a fibre described as a substitute for hemp, durable under water ; used in India for making drag ropes, fishing nets, &c. The stems are used as stakes for " Betel Pepper " (*Piper Betle*) (Watt. Comm. Prod. India, p. 988).

Suitable for growing with cocoa, coffee, &c., as a green manure.

Growing as a shrub on the banks of streams, Katagum (Dalziel, Herb. Kew).

For cultivation and preparation of the fibre, see *Crotalaria juncea*. In India about 30 lb. of seed is sown to the acre ; the crop comes to maturity in about 5 months, but according to Watt (l.c.) the fibre does not suffer if the plants are not cut until the seed is ripe.

Ref.—" *Sesbania aculeata*," in Dict. Econ. Prod. India, vi. 2, pp. 542–543.—*Ibid.* in Comm. Prod. India, Watt, pp. 987–988.

Sesbania aegyptiaca, *Pers.*; Fl. Trop. Afr. II. p. 134.

Ill.—Rheede, Hort. Mal. vi. t. 27; Bot. Reg. (1825), t. 873 (*S. picta*); Ralph, Ic. Carp. t. 38, f. 9 (pod and seeds); Wight, Ic. Pl. Ind. Or. i. t. 32.

Vernac. names. — Turi - abang; Rumpat Kakatjangan (Java, Tropenpfl. 1902, p. 427); Maweengo-weengo (Madi, *Grant*).

In India the juice of the bark, the leaves, seeds and root are used for various medicinal purposes (Dict. Econ. Prod. India), the wood is used for poles, and to make gunpowder charcoal; the bark is made into rope and the leaves and branches used as a cattle fodder (Gamble, Man. Indian Timb. p. 235).

Used as a fodder in Java (Tropenpfl. 1902, p. 427).

The natives of Madi put the seeds into a gourd which they use as a rattle when herding cattle (Grant, Trans. Linn. Soc. xxix. 1872, p. 57).

Ref.—"*Sesbania aegyptiaca,*" in Dict. Econ. Prod. India, Watt, vi. 2, pp. 543–544.

Sesbania punctata, *DC.*; Fl. Trop. Afr. II. p. 133.

Vernac. names.—Zamarke (Katagum, *Dalziel*); Tawri (Arabic, *Muriel*); Sabral (French Guinea, *Moloney*).

Nupe; Katagum; Lokoja; Bornu; Chad Region; and widely distributed in Tropical Africa, India, &c.

Hausa natives use a decoction of the leaves for washing animals, as a preventive of the bite of the tsetse fly (Richardson, Herb. Kew).

Recommended for growing as a green manure. At Westacre, in the Matoppos, Rhodesia, land on which this plant had grown, gave better crops of Lucerne and oats than elsewhere (Rhodesian Agric. Journ. June, 1909, p. 567). Forms dense impregnable hedges (Parsons, Herb. Kew).

May be propagated by seed.

Found growing as a small shrub on sand banks in Nupe (Barter, Herb. Kew); a very common river shrub, about 10 feet high, overhanging Nigerian streams (Parsons, Herb. Kew); at an altitude of 5000–6500 ft. Aberdare Range, B. E. Africa (Battiscombe, Herb. Kew); 6000–7000 ft. Nyika Plateau (Whyte, Herb. Kew); grows 10 to 12 feet high in damp marshy places, Angola, where it is common in the interior but scarce near the sea (Monteiro, Herb. Kew).

Ref.—"*Sesbania punctata,*" Nobbs, in Rhodesian Agric. Journ. June, 1909, p. 567; (Reprint in Agric. News, Barbados, 1909, p. 271).

HEDYSARUM, Linn.

Hedysarum coronarium, *Linn.* Sp. Pl. (1753), p. 750.

A perennial plant, deep rooted, 1–6 feet high, stems ascending, pilose. Leaflets 2–5-paired, large, elliptic or obovate, glabrous above, appressed silky pubescent below. Inflorescence a many flowered raceme; flowers scarlet or dark red.

Ill.—Fl. des Serres, t. 1382; Rchb. Ic. Fl. Germ. xxii. t. 2246, f. 1.

Sulla; Le Sainfoin à bouquets; Sainfoin d'Espagne; French Honeysuckle.

A valuable fodder plant, grown in S. Europe. This plant was recommended for trial in Lagos some years ago (Kew, 18th March, 1892), but no records of any success are available.

In an experiment at the Botanic Station, Lagos, in 1892, with "Sainfoin d'Espagne," the seed was reported to have germinated freely but damped off (Millen, Rep. Bot. St. Lagos, 1892).

It is considered suitable for culture in tropical and sub-tropical climates, and will stand drought. It has been recommended for cultivation in the Gulf States and other warm parts of N. America (Kennedy, U.S. Dept. Agric. Div. of Agrostology, Bull. No. 22, 1900, p. 57), *see* Alfalfa (*Medicago sativa*) for general details of culture.

ALHAGI, Desv.

Alhagi maurorum, *Desv.*; Fl. Trop. Afr. II. p. 142.

Ill.—Spach Suites (Hist. Nat. Vegetaux) t. 4, f. 1; Ralph, Ic. Carp. t. 39, f. 29; Engl. & Prantl, Pflan. iii. pt. 3, f. 123 B.

Common in the Syrian and Egyptian deserts (Fl. Trop. Afr. l.c.). A common desert plant eaten greedily by camels (Grant, Trans. Linn. Soc. xxix. 1872, p. 58).

Ref.—"*Alhagi maurorum,*" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 164–166.

HERMINIERA, Guill. et Perr.

Herminiera Elaphroxylon, *Guill. et Perr.*; Fl. Trop. Afr. II. p. 144.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 51; Kotschy, Oesterr. Bot. Zeitsch. viii. 1858, p. 1 (*Aedemone mirabilis*); Ralph, Ic. Carp. t. 38, f. 8; Engl. & Prantl, Pflan. iii. pt. 3, p. 320, f. 124 A (*Aeschynomene Elaphroxylon*).

Vernac. names.—Mbilor (Senegal, *Moloney*), M'Bilor or Bilor (Ouloff, *Chevalier*); Bimba (Angola, *Welwitsch*, *De Wildeman*); "Tripol" (Angola, *Edwards Bros.*); Malindi (Uganda, *Mahon*); Odifonga (Madagascar, *Baron*); Ambash (Nile, *Grant*).

Nupe; Lake Chad; and widely distributed in Tropical Africa.

The natives in the Nile region use the logs for crossing rivers (Grant, Trans. Linn. Soc. xxix. p. 58); and on the Congo for rafts (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 354); in Benguela and Mossamedes the wood is used for domestic purposes, such as beds, stools, &c., and more especially for fishing punts and landing boats (Hiern, Cat. Welw. Afr. Pl. i. p. 233). Welwitsch used the wood to make boxes for his entomological collections (l.c. p. 234).

The wood is exceedingly light; though according to Welwitsch (l.c.) it is strong and durable. A specimen from Uganda in the Museum at Kew has a specific gravity 0·1678=10·5 lbs. per cubic foot. Another specimen from Angola has a specific gravity 0·1984=12·35 lbs. per cubic foot.

Attempts have been made to introduce the wood into commerce. The only prospect of success, would be as wood-pulp for the manufacture of coarse brown paper, but the cost of consignment of the raw material is prohibitive (Bull. Imp. Inst. 1904, p. 226).

When in flower the shrub is very ornamental.

Grows on river banks with stems in the water, Nupe (Barter, Herb. Kew); mangrove-like in the shallow water of the Victoria Nyanza, and in estuaries and marshes (Johnston, Herb. Kew); answers on the lake shore (Uganda) to the mangrove of other countries and forms a dense thicket out in the water to the depth of a man, the gouty stems sometimes being 3 feet in diameter and forming an effective barrier to canoe men (Mahon, Mus. Kew—he translates the native name "Malinda" as "wait a bit" because the spiny branches catch the clothes of the natives); grows abundantly in marshes and by streams along nearly the whole coast of Angola, where it is stated not to exceed 20 or at the most 25 feet in height, the trunk at the base measuring 6–16 inches in diameter (Hiern, Cat. Welw. Afr. Pl. i. pp. 233, 234). It grows very quickly.

Ref.—"The Ambach Wood of the Soudan," in Bull. Imp. Inst. ii. 1904, pp. 225–227.——"*Herminiera Elaphroxylon*, Guill. et Perr." in Les Végétaux Utiles de L'Afrique Tropicale Française, Chevalier, iii. pp. 108–110 (Challamel, Paris, 1907).

AESCHYNOMENE, Linn.

Aeschynomene aspera, *Linn.*; Fl. Trop. Afr. II. p. 147.

Ill.—Wight, Ic. Pl. Ind. or. i. t. 299; Ralph, Ic. Carp. t. 36, f. 21 (after Wight, Ic. l.c.).

Vernac. names.—Shola or Sola (India, *Watt*).—Soft sola-pith plant.

Lagos and West Africa in general, extending to Angola and Zambesiland. Found also in India, Burma, &c.

The soft pith-like wood is used to make helmets, floats, fancy articles such as artificial flowers, &c. The topis or sun hats of India are made of this material, sometimes exported to Europe in a finished or partly finished state from Bengal.

In India the leaves are sometimes eaten as a pot-herb, and an oil is extracted from the seeds, which is used in the treatment of cramp and pain in the side (Watt, Agric. Ledger, No. 6, 1902, p. 152).

Grows as a floating bush on land annually inundated, or within the margins of tanks throughout Bengal and the greater part of Assam, usually in 2–4 or 6 feet of water; not cultivated, but at certain seasons of the year the upper portions bearing pods are cut and thrown on the water the seeds thus becoming self-sown (Watt, Comm. Prod. India, p. 29); in marshy palm groves and thickets along the banks of the river Cuanza, Pungo Andongo (Hiern, Cat. Welw. Afr. Pl. i. p. 234).

Ref.—"*Aeschynomene:* The Sola-Pith Plant," Watt, in Agric. Ledger, no. 6, 1902, pp. 149–154, a review of existing information. ——"Note sur le Sola or *Aeschynomene aspera*," Achard, in L'Agric. prat. pays chauds, vi. 2, 1906, pp. 248–250.——"*Aeschynomene aspera*," in Comm. Prod. India, Watt, pp. 28–30.

Aeschynomene indica, *Linn.*; Fl. Trop. Afr. II. p. 147.

Ill.—Rumpf. Amb. iv. t. 24; Rheede, Hort. Mal. ix. t. 18; Wight, Ic. Pl. Ind. Or. ii. t. 405.

Vernac. names.—Sola (India).—Hard sola-pith plant.

West Africa, India, Burma, &c.

Used like the preceding, except that being harder it is not so well adapted to the manufacture of fancy or delicate articles. The main part of some of the Indian topis are made of this pith, with merely a covering of the whiter and softer pith of *A. aspera.*

It is extensively used in India for making elephant pads, a useful fuel with the reputation of being of special value in firing pottery, and the charcoal made of it is used in the manufacture of gunpowder and fireworks (Watt, Agric. Ledger, No. 6, 1902, p. 153).

Usually found growing near, but above water level. Observed in damp pastures in Ambaca (Hiern, Cat. Welw. Afr. Pl. i. p. 234).

Ref.—"*Aeschynomene indica*," Watt, in Agric. Ledger, no. 6, 1902, pp. 153–154.——*Ibid.* in Comm. Prod. India, Watt, pp. 28–30.

ARACHIS, Linn.

Arachis hypogaea, *Linn.;* Fl. Trop. Afr. II. p. 158.

Ill.—Rumpf. Amb. v. t. 156, f. 2 (*Chamaebalanus japonica*); Gaertner, Fruct. Sem. Pl. t. 144; Lam. Encycl. t. 615; Desc. Ant. iv. t. 267; Dict. Sc. Nat. tt. 254, 255; Ralph, Ic. Carp. t. 36, f. 27; Ann. Sc. Nat. Paris, xix. (1853), t. 15; Ann. Soc. Hort. Paris, 1854, t. 1; Mart. Fl. Bras. xv. pt. 1, t. 23; Botanisk Tidsskrift, i. (1866) t. 1, ff. 1–9; Church, Food Grains, India, p. 126, f. 22; Jackson, Comm. Bot. 19th cent. p. 109; Agric. Gaz. N.S. Wales, ii. 1891, t. 28; Handb. Comm. Prod. Imp. Inst. Series, No. 24, 1893, p. 5 (after Jackson, l.c.); Heuzé, Pl. Industr. ii. p. 134, f. 30; Engl. & Prantl, Pflan. iii. pt. 3, p. 325, f. 125, A–C; Engl. Pflan. Ost. Afr. Th. B, p. 116; Köhler, Med. Pflan. iii.; Journ. New York Bot. Gdn. ii. 1901, p. 116, f. 9 (after Jackson, l.c.); Agric. News Barbados, 1902, p. 137, f. 13 (from Dict. Gardening); *Ibid.* 1907, p. 315; West Indian Bulletin, iv. 1904 p. 102 (from Dict. Gardening); Journ. Dept. Agric., W. Australia, xiv. 1906, p. 21, f. 1; p. 22, f. 2 (plant shewing nitrogenous nodules on the roots); p. 22, f. 3 (habit, 3 ft. diam.); L'Agricoltura Coloniale, i. Aug.–Sept. 1907, t. 4; L'Agric. prat. pays. chauds. vii. 2, 1907, p. 189, t. 1 (types of fruit); page 299, f. 12 (Arachide du Sénégal); p. 300, ff. 13–16 (*ibid.* seeds); p. 301, ff. 17–19 (Arachides de Casamance); p. 304, ff. 20–23 (seed, Egypte, Java, Mozambique); p. 305, f. 24 (Arachide d'Egypte), f. 25 (d'Java); p. 306, f. 26 (de Mozambique); Cycl. American Agric. ii. ff. 735–740; Adam, L'Arachide, ff. 1–9 (types of fruit); ff. 10–26 (plants, fruits, and seeds of various types); Queensland Agric. Journ. xxii. 1909, tt. 37–40; Beattie, U.S. Dept. Agric. Farmers' Bull. No. 356, 1909, ff. 4, 16, 17, 18.

Vernac. names.—Geda or Gedda (Hausa, *Dudgeon*); Biriji (Yola, *Dalziel*); Epa (Lagos, *Dawodu*); Egpa (Yoruba, Bull. Imp. Inst. 1907, p. 328); Guchia (Nupe, l.c.); Ekpa (Nargo, Gold Coast, *Easmon*); Nkchtia (Accra, and Fanti, Gold Coast, *Easmon*); Bienyabwa (Uganda, *Dawe*); Fûl Sennari (Egypt, Journ. Soc. Arts, xxxiv. p.173); Cacaouette (Algeria, *Burkill*); Jinguba (Golungo Alto, *Welwitsch*); Katchangtarah or Katjang-tana (Java, *Henshall*, *Safford*); Katchangtanah (Malaya, Mus. Kew); Mani (Venezuela, Mus. Kew); Mani (Panama, Peru, Chili, Philippines, *Safford*); Ndjugu (Zanzibar, *Engler*); Seyana Beans (Cyprus, Mus. Kew); Nela Kodala (Ceylon, *Wright*); Jamboo Seed (Bombay, Mus. Kew).—Pistache de terre; Erdnuss; Ground Nut; Earth Nut; Pea Nut; Monkey Nut; Pindar Nut; Foreign Bean (China, *Bretschneider*); Mozambique Gram (Bombay, *Dymock*); Goober Nut (U. States, *Hick*, *Handy*).

Northern and Southern Nigeria, and probably throughout Tropical Africa, Asia, America, and Australia. Cultivated. Grown also in many sub-tropical countries. Probably native of South America.

The uses to which the ground nut is put are numerous; as dessert after being roasted; in confectionery, for the manufacture of "pea-nut butter." The oil is a good substitute for olive oil, for use in pharmacy, salads, tinning sardines, perfumery, lubricating and illuminating purposes, and equal to cotton seed oil for the various purposes to which that oil is put—cookery, soap-making, &c. The cake after the extraction of the oil is used for feeding cattle, and the burnt shells as a fertilizer. In the northern parts of N. Nigeria the oil is used for cooking (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 158), and in general throughout Nigeria the roasted and ground seeds are used in the preparation of "ground-nut soup"—a favourite native dish.

The ground shells, known as "Soga meal," are used mixed with molasses for feeding cattle. They are largely ground at Marseilles, where the meal is sold very cheaply—3 fr. to 3 fr. 50 per 100 kilog. f.o.b.; exported chiefly to Hamburg and Stettin, and to a certain extent to London, Liverpool, and Glasgow (Cons. Rep. Ann. No. 3230, 1904, p. 9). In Marseilles the nuts imported undecorticated (West Africa) are used for the extraction of edible oils, and those imported decorticated (India) for soap oils (l.c. p. 7). The finest soaps, known as "olive-oil soaps," are composed of varying mixtures of ground nut and olive oil. Pure olive-oil soap is about twice the price of ordinary soap (l.c. p. 9).

The plant is suitable for green manuring, and for this purpose the Pondicherry variety, which yields a greater proportion of leaf and stem has been recommended (Bull. Imp. Inst. 1906, p. 125).

It is a good fodder, both in a green state and when dried as hay.

The essentials of cultivation are comparatively simple—a tropical or sub-tropical climate, light rainfall (30–50 inches); plenty of sunshine; a light rich sandy loam with a fair proportion of lime and careful tillage until the pods have buried themselves in the soil to ripen. It is advisable to grow it only as a rotation crop with cotton, tobacco, maize, gero, or spiked millet, &c. as the crop is an exhausting one, and this course is also necessary as a preventive of disease.

Rotation appears to be the method adopted in Zaria and Kano where the ground nut is the first crop in the local system, and in Nupe and Yoruba where it is a terminal crop (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 158).

The best selected seed only should be used and sown on ridges about 2½—3 feet apart, the seeds in the rows being about 9—12 inches apart. If the seed be shelled it should be sown with as little delay as possible.

A crop matures in from three to six months according to the variety grown; although the proper time to harvest will depend largely upon local conditions.

Usually the harvesting is done by hand, but under a large acreage proper implements are required, and it is possible to obtain machines which dig, pick, clean and separate the nuts.

A good yield of nuts per acre may vary from about 1500 lbs. to 3000 lbs., and the yield of haulms or hay from one to two tons. Any quantity much less than this would probably not be profitable for commercial purposes.

Some experiments carried out at Oyo in the Western Province of Southern Nigeria (1908) gave a yield of undecorticated nuts of 1488 lbs. per acre. This result was obtained with seed from the Gambia, sown in the middle of April, under the supervision of two native planters from the Gambia (Dodd, S. Nigeria Govt. Gaz. July 14th, 1909, Suppl. p. 30). Other results obtained at Oyo were:—with Gambia nuts, sown middle of May, 926 lbs. per acre, and with native nuts, sown middle of April, 948 lbs. per acre (l.c.).

A good yield of oil is about 50 per cent., and this has been obtained from African (Rufisque), 52·48, Congo, 52·88, Egyptian, 52·3, Bombay, 50·47 and Japanese ground-nuts, 54·5 (*see* Handy, Farmers' Bull. No. 25, 1896, p. 5, and Burkill, Kew Bull. 1901, p. 178). A theory has been advanced but not proven that the more tropical the climate the greater will be the percentage of oil.

A sample of ground-nut oil from N. Nigeria examined at the Imperial Institute (1906) was found to compare very favourably with commercial oil in its composition, but on account of a peculiar odour and taste it was considered only suitable for soap-making (Bull. Imp. Inst. 1908, p. 356).

West Africa is perhaps the most important source of the supply of ground nuts, and they are shipped chiefly from the Gambia. In 1903, 92,784 tons of undecorticated ground nuts from the West Coast of Africa, and 86,291 tons of decorticated nuts from India, were imported into Marseilles (Cons. Rep. Ann. No. 3230, 1904, p. 7).

The following figures for 1909 indicate the importance of the trade (Gambia Govt. Gaz.) :—

	Quantity.	Value.	Export Duties.
	—	—	—
Tons ...	53,674	£323,231	£17,881

The figures for Nigeria, 1909, being (S. Nigeria, Govt. Gaz. Jan. 11th and 26th, 1910) :—

Tons ...	4,208	£29,389	—

The price of ground nuts in Liverpool is about £10 to £19 per ton: some prices ruling recently being :—

Rufisque	£16 10*s.* to £19
Bathurst (undecorticated) ...	£13 10*s.* to £17
Niger (undecorticated)	£10 10*s.* to £14 10*s.*
Niger (decorticated)	£11 5*s.* to £17 5*s.*
Congo „	£17.
Dakar	£15 10*s.* to £17 10*s.*

(selected from returns made by Messrs. Taylor & Co., Liverpool, between Nov. 1907, and June, 1910).

The cost of West African ground-nuts in shell delivered on the quay at Marseilles (1909), ranged from 22 fr. 50 c. to 31 fr. per 100 kilos (Cons. Rep. Ann. No. 4516, 1910, p. 17).

In Nigeria it would appear from the export returns that the greater part of the nuts grown there are used up locally.

In the country markets they are sold at, from 1*d.* to 1½*d.* a pound (McLeod, S. Nigeria Govt. Gaz. April 1st, 1908, Suppl. p. 1). An attempt to export undecorticated nuts from Iwo (Western Province), was not successful; the nuts were bought at the rate of £5 10*s.* to £7 per ton, but they were stated to be of bad quality, many of them decayed and mouldy, and there was great loss of weight in transit owing to the damp condition when bought. The merchants at Iwo have since offered £2 to £3 10*s.* for undecorticated, and £7 per ton for decorticated nuts (l.c.).

At Dakar (1909) the price quoted for Rufisque nuts was 20 fr. per 100 kilos (about 2*s.* per imperial bushel), and the Gambia crop (Dec. 1909) was offering at 1*s.* 6*d.* to 1*s.* 9*d.* per bushel. The higher price is for nuts at all river ports, and the lower for those bought in the interior (Dudgeon, Gambia Govt. Gaz. March 5th, 1910, p. 111).

The ground-nut appears to be grown in suitable localities throughout Nigeria.

Bida is an important centre (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 158), and the cultivation is being greatly increased in Nupe, where, it is said, about half the Province is adapted to the cultivation of cotton and half to the cultivation of ground nuts (Col. Rep. Ann. No. 516, 1907, p. 83). According to Sir William Wallace, this product could be grown in N. Nigeria for export in immense quantities ; it is grown only in the various belts of forest along the streams, and the quantity is not sufficient to meet local demands (Col. Rep. Ann. No. 551, 1907, p. 75).

Under cultivation there are several varieties, and numerous forms, divided primarily into " bunched " in which the stems grow erect and compact ; and " running " in which the stems are more or less procumbent. Among the " bunched " sorts the more important are " Virginia Bunch," a large white-podded variety, suitable for eating or dessert ; " Spanish," recommended both as a forage crop, and, in confectionery or for dessert, because of the sweet seeds ; "Tennessee Red," recommended more as a forage crop, the colour and quality of the pods and seeds being somewhat against it for marketable purposes ; and certain African varieties.

Of the " running " forms, the best are " Virginia Runner," with large white pods ; " North Carolina," which contains a high percentage of oil ; " Tennessee White," more suitable than the red for eating ; " African," including probably " Rufisque," or " Galam," " Cayor," " Egyptian," " Mozambique," &c. ; and "Indian," all of which yield a good percentage of oil and are capable of producing good crops of nuts and hay.

As with most cultivated products, the literature is extensive ; the the following list is representative of the more important works.

Ref.—" Oleum Arachis," in Pharmacographia, Flückiger and Hanbury, pp. 186-188——" *Arachis hypogaea*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 282–287.——" The Cultivation of the Pea Nut," Turner, in Agric. Gaz. N.S. Wales, ii. 1891, pp. 242–245.——" The Ground, Earth or Pea Nut," Subba Rao, Dept. Agric. Madras, Bulletin No. 28, 1893, pp. 259–289.——" The Ground or Earth Nut," Watt, Agric. Ledger, No. 15, 1893, pp. 1–46.——" The Value of Earth-Nut cake as a Feeding Material," Robertson, in Journ. Roy. Agric. Soc. 3rd Series, iv. 1893, pp. 648–651.——" Ground-Nut, Earth-Nut, or Pea-Nut," Handb. Comm. Prod. Imp. Inst. Series No. 24, 1893, pp. 1–13.——" Arachide," in Les Pl. Industrielles, Heuzé, ii. pp. 130–141 (Librairie Agric. de la Maison Rustique, Paris, 1893).——" Manufacture of Oil and Food from Pea Nuts in Germany, in Journ. Soc. Arts, xlii. 1894, pp. 745–746.——" *Arachis hypogaea*," Erdnuss," in Die Pflanzenwelt Ost Afrikas, Engler, Part B, pp. 115–122 (Dietrich Reimer, Berlin, 1895).——Pea Nuts, Culture and Uses, Handy, U.S. Dept. Agric. Farmers' Bulletin No. 25, 1896, pp. 1–23.——" *Arachis hypogaea*," in Medizinal Pflanzen, Köhler, iii. 5½ pp.——"The Ground-Nut," Benson, in Agric. Ledger No. 1, 1900, pp. 1–18, Reprint from Bulletin No. 37, Dept. Agric. Madras.——" Ground Nut or Pea Nut," Burkill, in Kew Bull. 1901, pp. 175–200.——" The Nature and Uses of the Pea Nut," in Journ. New York Bot. Garden, ii. 1901, pp. 114–123.——" L'Arachide," in Journ. D'Agric. Tropicale, 1901, pp. 12–17.——" Suite du dossier de L'Arachide," l.c. pp. 140–143.——" Sur la Fumure de l'Arachide," Couturier, l.c. 1902, pp. 35–38.——“Les Machines Agricoles pour l’Arachide,” Quelques considérations sur les machines pour la récolte et la préparation de la graine, Main, l.c. 1902, pp. 103-105.——“The Ground-Nut Industry of Barbados,” in Agric. News, Barbados, 1902, pp. 136–137.——“Earth or Pea Nuts,” in Queensland Agric. Journ. xii. 1903, pp. 397–398, with particulars of Crocker’s Separator and Crocker’s Pea Nut Sheller.——“Ground Nuts in the West Indies,” Freeman, in West Indian Bulletin, iv. 1903, pp. 101–110 ; Reprint in Pamphlet No. 25, 1903, pp. 1–26 ; issued by the Commissioner Imp. Dept. Agric. W. Indies (Dulau & Co., London).——“Ground Nuts in Ceylon,” Wright, Roy. Bot. Gdn. Ceylon, Circ. No. 23, 1904, pp. 367–383.——“Le Décortiqueur d’Arachides,” de M. Martin, in Journ. D’Agric. Tropicale, 1904, pp. 71–72, with fig. 4 (élévation) f. 5 (vue en bout).—“L’Irrigation des Arachides en Égypte,” D’Apres M. Henri Lecomte, l.c. pp. 239–241.——“L’Arachide en Egypte,” l.c. pp. 299–302,——“L’Arachide à Java,” Serre, l.c. 1905, pp. 363–364.——“*Arachis hypogaea* ou Arachide,” in Pl. Util. Congo, De Wildeman, Art. xxviii. pp. 397–481 (Spineux et Cie, Bruxelles, 1905).——“The Pea Nut and Its Culture,” Roper, pp. 1–62, illustrated (edition of the American Nut Journ. Petersburg, Virginia, 1905).——“Pea or Ground Nut,” Baker, in Journ. Dept. Agric. W. Australia, xiv. 1906, pp. 20–24.——“L’Arachide,” Dumas, in L’Agric. prat. pays chauds, vi. 1, 1906, pp. 369-380, “L’Agric. dans la Vallée du Niger,” with plate.——“Sur la rancidité des huiles d’Arachides de l’Inde,” Poulain, in Journ. D’Agric. Tropicale, 1906, pp. 187–188.——“Pea Nut,” Corbett, in Cycl. American Agric. Bailey ii. pp. 514–519.——“L’Arachide,” Baldrati, in L’Agricoltura Coloniale, i. 1907, pp. 101-119.——“Les Arachides Américaines et l’huilerie,” in Journ. D’Agric. Tropicale, 1907, p. 160 (from Daily Cons. Report, Washington, June 7th, 1905, R. P. Skinner).——“L’Arachide en Afrique occidentale française,” Adam, in L’Agric. prat. pays chauds vii. 2, 1907, pp. 186–202 ; pp. 297–306 ; pp. 375–387 ; pp. 494–510 ; viii. 1, 1908, pp. 53–65 ; pp. 142–157 ; pp. 232–244 ; pp. 314–327 ; pp. 402–409 ; pp. 488–496 ; viii. 2, 1908, pp. 49–60 ; pp. 113–127 ; and pp. 217-226.——“La Culture de L’Arachide aux Etats-Unis,” Haumont, l.c. viii. 2, 1908, pp. 422–427.——“The Ground Nut in Southern Nigeria, and how to Cultivate it,” McLeod, in S. Nigeria Govt. Gaz. April 1st, 1908, Suppl. pp. 1–2.——“*Arachis hypogaea*,” in Comm. Prod. India, Watt, pp. 74–83.——“L’Arachide : Culture, Produits, Commerce. &c.,” Adam, pp. 1–206, illustrated (Augustin Challamel, Paris, 1908).——“Report on Ground-Nut Experiments at Oyo, Oshogbo, and Oloke Meji,” Dodd, in S. Nigeria Govt. Gaz. July 14th, 1909, Suppl. p. 30.——“Pea Nut Trade and Manufacture of Pea Nut Oil and Cakes,” in Austria, Hotschick, U. States Cons. Rep. Washington, July, 1909, pp. 37–38.——“The Origin and Domestication of the Pea Nut or Ground Nut in the United States,” Andrew, in Tropical Life, Feb. 1909, pp. 20–21 ; March, 1909, pp. 36–38, illustrated ; Reprint “Cultivation of the Pea Nut,” in Queensland Agric. Journ. xxii. 1909, pp. 285–292, Plates xxxvii.-xl.——“Pea Nut Machinery,” in Queensland Agric. Journ. xxiii. 1909, pp. 199–200.——Pea Nuts, Beattie, U.S. Dept. Agric. Farmers’ Bulletin No. 356, 1909, pp. 1–40 ; illustrated machinery—planters, diggers, pickers, &c. ; Abstract in Agric. News, Barbados, 1909, pp. 372–373.——“Japanese Pea Nut Industry ; Cultivation, Production, Exports, and Making of Oil,” Babbitt, U. States Cons.

Rep. Washington, March, 1910, pp. 60–61.——"Useful Facts regarding the Ground Nut," in Agric. News, Barbados, 1910, pp. 68–69, from Bulletin No. 21, Station Agronomique, Mauritius.——"The Cultivation, Preparation, and Utilisation of the Ground-Nut," in Bull. Imp. Inst. 1910, pp. 153–172.

ZORNIA, Gmel.

Zornia diphylla, *Pers.*, Fl. Trop. Afr. II. p. 158.

Ill.—Rheede, Hort. Mal. ix. tt. 82–83 (Nelam-Mari); Mart. Fl. Bras. xv. pt. 1, t. 21 (vars. *elatior*, *gracilis*), t. 22 (vars. *latifolia*, *leptophylla*).

Vernac. name.—Rekureku (Lagos, *MacGregor*).

Katagum; Nupe; Lagos. Known also from Sierra Leone, Loanda, Nubia, Abyssinia, Uganda, and Mozambique.

Stored like clover in Europe, by the Foulahs and those people who keep horses, as provender for the dry season (Barter, Herb. Kew. Fl. Trop. Afr. l.c.; Moloney, For. W. Afr. p. 314).

Found growing abundantly in sandy soils in Nupe (Barter, Herb. Kew), dry grass land, Uganda (Wilson, Herb. Kew), and frequently with short herbage, in exposed rocky places, Pungo Andongo (Hiern, Cat. Welw. Afr. Pl. i. p. 239).

DESMODIUM, Desv.

Desmodium triflorum, *DC.*; Fl. Trop. Afr. II. p. 166.

Ill.—Burman, Fl. Indica. t. 54. f. 2 (*Hedysarum stipulaceum*); Wight, Ic. Pl. Ind. Or. i. t. 291; Mart. Fl. Bras. xv. pt. 1, t. 26, f. 1.

Ibadan: cosmopolitan in the Tropics.

Valued as a medicine for the cure of dysentery (Thwaites, Pl. Zeyl. p. 86; Moloney, For. W. Afr. p. 315).

Recommended as cover for ground, preparatory to setting out a rubber plantation; the best time to establish it at a minimum cost being immediately after the land has been burned off. Lalang or other weeds do not then start so readily, and there is no immediate necessity of putting in the rubber plants, as the ground will improve under the growth of the *Desmodium*, and the cost of cutting it away when the rubber plants are ready to be put out is comparatively little (Philippine Agric. Rev. 1909, p. 289). The plant is also suitable for growing as green manure in any plantation. In India it helps to form good turf; and cattle like it (Dict. Econ. Prod. India).

It may be propagated by seeds, but as these are not readily obtained, perhaps the best way is to transplant it from the roadsides or from any waste place where it may be found growing in a wild state. The plant is usually abundant. It is found abundantly on dry paths in sandy soil; Mahela, Sierra Leone (Scott Elliot, Herb. Kew); covering the ground with a dense mat, Onitsha (Barter, Herb. Kew), in dry sandy soil at an altitude of 1100 feet, Stanley Pool, Congo, (Fr. Hens, Herb. Kew).

URARIA, Desv.

Uraria picta, *Desv.*; Fl. Trop. Afr. II. p. 169.

Ill.—Jacq. Ic. Pl. Rar. iii. t. 567 (*Hedysarum pictum*); Wight, Ic. Pl. Ind. Or. ii. t. 411.

Vernac. names.—Alupayida (Lagos, *Punch*, *MacGregor*, *Dawodu*); Alupaida (Badagry, *Millen*); Caiala camoxe, or Camoxo-caiala (Golungo Alto, *Welwitsch*); Dabra (Hindoo, *Watt*, *Dymock*).

Lagos, Abeokuta, Badagry, in S. Nigeria; Nupe, and Bassa, in N. Nigeria. Found also in many other parts of Tropical Africa to Zambesiland, and in India, Ceylon, Malaya, Philippine Islands, &c.

The leaves beaten to powder are used for the cure of gonorrhoea in Lagos (Punch, Herb. Kew), used medicinally in Lagos (Millen, l.c.). In the Punjab the fruit is used as an application to the sore mouths of children, and in Southern India the plant is a supposed antidote to the poison of the phúrsa snake.—*Echis carinata* (Dict. Econ. Prod. India).

Found as a common weed, Bassa Province (Elliot, Herb. Kew); common in moist places, Nupe (Barter, l.c.); on dry rocky soil, altitude 700–800 feet, Congo region (Fr. Hens, l.c.); on rocky soil, Madi (Speke & Grant, l.c.); on sandy plains, altitude 2000 feet, Lake Albert (Dawe, l.c.); at an altitude of 2000–6000 feet, Nyasaland (Whyte, l.c.); 8000 feet, Nyika Plateau (McClounie, l.c.)

ALYSICARPUS, Neck.

Alysicarpus rugosus, *DC.*; Fl. Trop. Afr. II. p. 171.

Vernac. name.—Gadiggi (Katagum, *Dalziel*).

Katagum; Niger; and extending through Tropical Africa to the Cape. Found also in Tropical Asia, Australia, and the West Indies.

Food for horses, sheep, goats, &c. Katagum (Dalziel, Herb. Kew).

CICER, Linn.

Cicer arietinum, *Linn.*; Fl. Trop. Afr. II. p. 172.

Ill.—Lam. Encycl. t. 632; Schk. Handb. t. 202; Zorn. Ic. Pl. Medic. ii. t. 146; Plenck. Ic. vi. t. 564; Bot. Mag. t. 2274; Sibth. Fl. Gr. viii. t. 703; Wight, Ic. Pl. Ind. or. i. t. 20; Duthie, Field Crops, i. t. 8; Church, Food Grains, India, t. 23; Agric. Gaz. N.S. Wales, ii. 1891, t. 43; Rchb. Ic. Fl. Germ. xxii. t. 267.

Chick Pea; Egyptian Pea; Horse Gram; Black Gram; Bengal Gram; Garavance; Chiches (Bot. Mag. l. c.); Idaho Pea.

Cultivated in Africa, India, S. Europe, &c.

One of the most nutritious of the pulses, and grown chiefly for food. In France it is used roasted as a substitute for coffee. The parched seeds are also used in confectionery; the green peas as a vegetable; the meal for making porridge, and the young plants may be eaten like spinach. Frequently carried by travellers crossing deserts, being considered more capable of supporting life, weight for weight, than any other kind of food (Mus. Kew).

The seeds are good fodder for horses, cattle, sheep, &c., but the plant is not suitable for this purpose, as the leaves contain an acid (oxalic chiefly), which in excess would be poisonous.

This acid, known as "Kudlee Hoolee" in Bombay, is so sharp as to destroy the shoes of a person walking through a field where the plants grow (Frere, Mus. Kew). A solution of the leafy secretion is collected in India by spreading cloths over the plant at night, and wringing them out the next morning when wet with dew. This solution is used in the preparation of cooling drinks and as vinegar. False "Toolsi" beads are made from the roots in Madras (Grant-Duff, Mus. Kew).

May be propagated by seed, sown broadcast or in drills. A warm climate, moderate rainfall, ample sunshine, and a loamy soil are favourable to its development. The plant is suitable as cover to prevent weeds, as green manure, and is well adapted to cultivation under irrigation. It comes to maturity in about six months.

The average yield has been estimated at about 600 lbs. per acre (Watt, Comm. Prod. India, p. 297).

There are no records of this plant in Nigeria except that it occurs in a list of plants in the Botanic Station, Lagos (Millen & Rowland), but it would probably succeed there. It grows well in Guam, a tropical country (Safford, Pl. Guam (Contr. U.S. Nat. Herb. ix. 1905), p. 281), and is considered suitable for cultivation in N. Queensland (Newport, Queensland Agric. Journ. xiv. 1904, p. 359).

Ref.—"*Cicer arietinum*" in Field and Garden Crops, Duthie & Fuller, i. pp. 33–36 (Thomason Civil Eng. College Press, Roorkee, 1882).——"The Chick Pea," in Food Grains of India, Church, pp. 128–131, with analysis.—"The Cultivation of the Chick Pea," Turner, in Agric. Gaz. N.S. Wales, ii. 1891, pp. 442–443.——Gram, Chick Pea, or Idaho Pea, Smith, U.S. Dept. Agric. Div. of Agrostology, Circular No. 7, 1898, pp. 1–4. ——"Pois Chiche," in Pl. Potagéres, Vilmorin Andrieux, p. 572 (Paris, 1904).——"*Cicer arietinum*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 274–284 and in Comm. Prod. India, Watt, pp. 295–302.

LATHYRUS, Linn.

Lathyrus sativus, *Linn.*; Fl. Trop. Afr. II. p. 174.

Ill.—Lam. Encycl. t. 632; Bot. Mag. t. 115; Gaertner, Fruct. sem. Pl. iii. t. 152; Sibth. Fl. Gr. vii. t. 695; Jacq. Eclogae Pl. Rar. ii. t. 116; Duthie, Field Crops, ii. t. 32; Church, Food Grains, India, t. 24; Rchb. Ic. Fl. Germ. t. 2250, ff. 1, 2.

Vernac. names.—Sobbeure; Ater; Shimbera (Lower Guinea, *Moloney*); Jarosse or Gesse (S. Europe, *Moloney*)—Chickling Vetch.

Cultivated in many tropical and sub-tropical countries, the seeds being used for food both for men and animals. The pods are sometimes eaten when green and the plant used for fodder.

There is some danger in the use of this pulse for food, cases of poisoning are not uncommon, and a disease known as "Lathyrism" is frequently produced. This is a cerebro-spinal affection which results in paralysis of the lower limbs.

Ref.—"*Lathyrus sativus*," in Field and Garden Crops, Duthie & Fuller ii. pp. 15–16.——"The Vetchling" in Food Grains of India, Church, pp. 132–135.——"Lathyrus Fodder," in Kew Bull., 1894, pp. 349–352.——"*Lathyrus sativus*," in Bull. Imp. Inst. 1. 1903, pp. 17–18.——"*Lathyrus sativus*," in Dict. Econ. Prod. India, iv. 1890, pp. 590–594; and in Comm. Prod. India, Watt, pp. 703–706 (John Murray, London, 1908).

PISUM, Linn.

Pisum sativum, *Linn.* Sp. Pl. (1753) p. 727.

An annual plant, so well known in gardens at home that description is needless.

Ill.—Plenck, Ic. vi. t. 559 ; Burnett, Pl. Util. i. t. 17 b, f. 1 ; Duthie Field Crops, ii. t. 32a ; Rchb. Ic. Fl. Germ. xxii. t. 270.

Garden Pea.

Peas planted during the month of May (1906) at Ibadan, grew to a height of 5 feet with a satisfying yield. The best months for planting (at Ibadan) are said to be May, June, and July (Ricketts, S. Nigeria Govt. Gaz. 3rd March, 1909, Suppl. page 11).

The dwarf varieties are considered most suitable to the climate of Singapore, and early sorts such as American Wonder and Laxton's No. 1 have been recommended. The results are stated to be more satisfactory when grown on the hills than on the plains (Agric. Bull. Malay Penin. Dec. 1898, p. 189).

Ref.—" The Pea, *Pisum sativum*," in Food Grains of India, Church, pp. 135–136.——" *Pisum sativum*," in Dict. Econ. Prod. India, Watt, vi. 1, A. 1892, pp. 277–281.

ABRUS, Linn.

Abrus precatorius, *Linn.* ; Fl. Trop. Afr. II. p. 175.

Ill.—Rheede, Hort. Mal. viii. t. 39 ; Rumpf. Amb. v. t. 32 ; Sloane, Voy. Jamaica, i. t. 112, ff. 4, 5, 6 (*Phaseolus glycyrrhizites*) ; Lam. Encycl. t. 608 ; Tuss. Ant. iv. t. 18 ; Desc. Ant. iv. t. 275 ; Dict. Sc. Nat. t. 250 ; Velloso, Fl. Flum. vii. t. 98 ; Blanco, Fl. Filip. t. 156 ; Ralph, Ic. Carp. t. 30, f. 2 ; Bentl. & Trimen, t. 77 ; Engl. & Prantl. Pflan. iii. pt. 3, f. 130 (after Bentl. & Trimen) ; Greshoff, Nutt. Ind. Pl. t. 49 ; Contr. U.S. Nat. Herb. ix. t. 31 (*Abrus Abrus*).

Vernac. names.—Misimisi, or Iwere-jeje (Lagos, *Dawodu*) ; Katumbar (Lake Nyasa, *Johnson*) ; Fingo gifingo (Golungo Alto. *Welwitsch*) ; Panacoco (French Guiana, *Heckel*) ; [Kolales halom—tano (Guam) ; Sagasaga (Philippines) ; Matamamoso (Samoa) ; Pepitio (Tahiti) ; Peronia (Porto Rico) *Safford*] ; Yoay pyoo than (Moulmein, *Mus, Kew*) ; Barricarri (Brit. Guiana, *Vilmorin Andrieux & Co.*)—Crabs Eyes, Jequerity Seed, Prayer Beads, Indian Liquorice, Rati Seed.

Lagos, Old Calabar and throughout Tropical Africa and the Tropics generally. Often cultivated.

In Lagos the plant is used together with limes for coughs and irritation of the chest (Moloney, Herb. Kew). The leaves are used as an unguent, Sierra Leone (Scott Elliot, Herb. Kew). In Nyasaland the roots are cooked with beans for urine disease (Archdeacon Johnson, Herb. Kew). The roots are also used as a substitute for Liquorice (*Glycyrrhiza glabra*).

The seeds are poisonous, the active principle is "Abrin." Made into a paste and inserted below the skin of man or beast, death results in a few hours. The lethal dose, according to Kobert, is only ·00001 grm. per kilo of the weight of the animal, though when boiled the seeds may be eaten, since their poisonous property is then destroyed (Watt. Comm. Prod. India, p. 1).

In Egypt the seeds are used as food, but are considered very hard and indigestible. Used in ophthalmia (Moloney, For. W. Afr. p. 316; Kew Mus. Guide, No. 1, p. 65), and in French Guiana for a similar purpose (Heckel, Pl. Med. et Toxiq. Guy. Franç. in Ann. l'Inst. Col. Marseille, iv. 1897, p. 133).

According to Dr. Moura, the seeds have long been used in Brazil for chronic granular conjunctivitis, but require very careful application. Hindoo medical authors recommend a paste of the powdered seeds for outward application in nervous diseases (Moloney, p. 316; Pharm. Journ. [3] xiv. 1883, p. 4; Bentley & Trimen, Med. Pl. ii. No. 77).

In India the seeds are employed by Jewellers, Druggists, Goldsmiths, &c., as a standard weight under the name of "Rati." They are often used for ornamental purposes.

The plant has been recommended as a weather gauge, and experiments have been conducted by Nowack to prove its value for this purpose, but the idea seems to have been exploded (see Kew Bull. 1890, pp. 1–28).

May be propagated by seed, and is very easily grown.

Ref.—"*Abrus precatorius*," in Medicinal Plants, Bentley & Trimen, ii. No. 77.——Nouvelles recherches sur le vrai et le faux Jéquerity, Heckel, in Journ. "Le Progrès de Genève," 1887.——"*Abrus precatorius*" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 10–14.——"The Weather Plant," in Kew Bull. 1890, pp. 1–28.——"*Abrus precatorius*," in Nuttige Indische Planten, Dr. Greshoff, pp. 225–231 (De Bussy, Amsterdam, 1894).——"Jequiritol," in Merck's Ann. Rep. 1909, pp. 47–53.

CLITORIA, Linn.

Clitoria Ternatea, *Linn.*; Fl. Trop. Afr. II. p. 177.

Ill.—Commelin, Hort. Med. Amstel. Pl. i. t. 24 (*Phaseolus indicus*); Rheede, Hort. Mal. viii. t. 38; Rumpf. Amb. v. t. 31; Gaertner, Fruct. Sem. Pl. t. 149; Lam. Encycl. t. 609; Bot. Mag. t. 1542; Geel, Sert. Bot. v.; Rchb. Exot. iv. t. 226; Paxton, Mag. vii. p. 147; xiii. p. 79 (var. *major*); Hortic. Univ. iv. p. 361; Ralph, Ic. Carp. t. 36, f. 5; Burnett, Pl. Util. iv. t. 97a; Martius, Fl. Bras. xv. pt. 1, t. 31, f. 1; The Garden, xxxviii. 1890, p. 132; Journ. Hort. ser. 3, xxxi. 1895, p. 139.

Vernac. names.—Cajlee (Bombay, *Chantre*, *Dymock*); Kajalee (India, *Dymock*); [Bukike (Guam.); Calocanting (Philippines); Bejuco de Conchitas (Porto Rico), *Safford*].—Blue Pea.

Abeokuta; Maifoni (Bornu); throughout Tropical Africa and the Tropics generally. Often cultivated.

The root is purgative and used to promote sickness and vomiting. It is also a powerful cathartic (Safford, Pl. Guam. p. 232). The powdered ripe seeds are aperient and purgative (Waring, Pharmacop. India, p. 80).

The flowers yield a blue dye, stated by Rumphius to be used for colouring boiled rice in Amboyna (Moloney, For. W. Afr. p. 317, and Dymock, Veg. Mat. Med. W. India, p. 190).

The seeds exhausted with spirit yield a light brown resin with an odour like jalap (Dymock, Pharm. Journ. [3] vii. p. 190).

The plant propagates readily from seed, and is easily cultivated. It grows and flowers freely in the Botanic Gardens, Old Calabar. Found growing in the grass, in low moist places, Angola (Monteiro, Herb. Kew); in dried-up clayey fields flooded in the summer, in dry sandy places, on plains flooded in the rainy season, and in fields after a crop of maize, Loanda (Hiern, Cat. Welw. Afr. Pl. i. p. 248), in dry sandy ground climbing over Euphorbias, Golungo Alto (Fl. Trop. Afr. l.c.); at an altitude of 2000 ft., Taita Hills, B.E. Africa (Grenfell, Herb. Kew); 4000 ft., W. Ankou, Uganda (Dawe, Herb. Kew).

It is a handsome decorative plant, and well worthy of cultivation for this purpose.

Ref.—"*Clitorea Ternatea*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 375–377.

GLYCINE, Linn.

Glycine Soja, *Sieb. & Zucc.*, in Abh. Akad. Muench. iv. 11 (1843), p. 119. [*Glycine hispida*, Maxim., in Bull. Acad. Pétersb. xviii. (1873), p. 398].

Annual; stems sub-erect or climbing; 1½ to 4 ft. densely clothed with fine ferruginous hairs. Leaves trifoliate with petioles 3–6 in. long; leaflets membranous, ovate, acute, 2–4 in. long by 1½–2 in. broad. Calyx densely hairy. Corolla reddish, slightly exserted. Pods usually only 2–3 in the axil of each leaf, densely pubescent 1½–2 in. long, ⅓–⅜ in. broad. Seeds 3 or 4 in each pod; spherical, or nearly so, sometimes flattened, about ¼ in. in diameter; black, brown, yellow, green or mottled, according to the variety.

Ill.—Agric. Gaz. N.S. Wales, ii. Nov. 1891, t. 61 (*Soja hispida*); Duthie, Field Crops, iii. t. 85; Church, Food Grains, India, t. 26; Engl. & Prantl. Pflan. iii. pt. 3, f. 131 B–D; Transv. Dept. Agric. Ann. Rep. 1903–04, p. 270, t. 1; Irish, 12th Report Missouri Bot. Gdn. 1901, t. 44, ff. 6–7 (seed, yellow soy); f. 8 (seed, black soy); f. 9 (seed, green soy); f. 10 (seed, Étampes soy); t. 46 (branch with pods); Ball, U.S. Dept. Agric. Bureau Pl, Industry, Bull. No. 98, 1907, t. 1 (soy bean varieties, coloured seeds), t. 2 (seeds and pods of the black-seeded group), t. 3 (*ibid.* brown-seeded and mottled-seeded groups), t. 4 (*ibid.* green-seeded and greenish-yellow-seeded groups), t. 5 (*ibid.* yellow-seeded group); Vilmorin Andrieux, Pl. Potagéres, p. 658 (Soja, d'Étampes; Soja ordinaire); Bull. Econ. Indo-Chine, 1905, p. 1159. U. S. Dept. of Agric. Farmers' Bull. No. 372, 1909, p. 5, f. 1, p. 8, f. 3 (seeds and pods of seven varieties).

Vernac. names.—Yuan Tow, Ching Tow, Pai-mei-Tow (Newchwang, *Ayrton*); Kachang-Kadele Putik (Borneo, *Motley*); Daizu Japan (*L'Agric. au Japon, Exp. Univ. de* (1900) *Paris*, p. 50).

Soy Bean, Soja Bean, China Bean, White Gram, American Coffee Berry, Japan Pea.

Cultivated in the warmer parts of Manchuria, China, Japan, India, Africa, America, &c. Under experimental cultivation in several British Colonies, including Nigeria and other parts of West Africa.

The plant is grown in America as a forage crop; for green fodder, hay, and ensilage. Like many other leguminous plants it has a special value under cultivation as a green manure.

In Japan and China the beans are largely used in the preparation of the sauce known commercially as "Soy," and there is also a preparation made from them called "Soya Milk." This so-called milk consists of the bean made into a thin paste with water, boiled, and concentrated by adding sugar, and evaporating to a syrupy consistence; it is then suitable for mixing with tea, coffee, &c., as a substitute for milk proper. "Tofu" is a food product used in Japan made from the above preparation, and it in turn forms the basis of the "bean cheeses" of that country (Katayama, Bull. College of Agric. Tokyo, vii. 1906, p. 118). Bean cheese is said to be a very popular article of food with all classes of natives; it costs about 1 cent a cake, and about 6 or 8 cents a pound (Ridley, Agric. Bull. Straits and Fed. Malay States, 1904, p. 496).

The beans are also an important article of food, being used in the East like peas in this country, as a vegetable, in soups, &c., and roasted and ground they are made into a beverage somewhat resembling coffee.

The meal is used in the manufacture of biscuits, and in the preparation of a bread intended for special use in diabetes; probably because of the absence of sugar and starch in the seed.

The principal use of the beans in this country is for the extraction of the oil, of which they contain about 18 per cent. suitable for soap making, and in general as a substitute for cotton-seed oil. The residue after the extraction of the oil is suitable for feeding cattle, and for this purpose appears likely to become a serious competitor of cotton-seed cakes, sunflower-seed cakes, linseed cakes, &c. The beans can be bought in London at about £5 to £6 per ton, the oil realises about £21 to £22 per ton, and the cake about £6 to £7 per ton. The price of the beans f.o.b. at Vladivostok in 1909 was 72 copecks per pood (4*s.* 8*d.* per cwt.), made up approximately as follows (Board of Trade Journ. No. 665, Aug. 26th, 1909, p. 423.) :—

	* Copecks.	
Price in Kharbin (or Harbin)	44	per *pood
Rail to Vladivostok	18½	,,
Station dues	1½	,,
Chinese Export duty	1¾	,,
Discharging trucks and loading ...	2¼	,,
Bank charges	4	,,
Total	72	per pood.

Yellow Soya Beans grown in West Africa have been found quite equal in their constituents to those grown in Japan or China. The result of the analysis was as follows: Moisture, 10·52 per cent.; Ash, 4·62; Oil, 17·26; Albuminoids, 36·05; Carbohydrates, 26·16; and Woody Fibre, 5·39 per cent. (Edie, Bull. No. 1, 1909, p. 7, Inst. Comm. Res. Liverpool Univ.). According to analyses of the several varieties of seed (l.c. p. 6), from India and the United States of representative samples of different shipments into Liverpool, the constituents appear to vary to no appreciable degree in any of the varieties. As a feeding material the Soya Beans are considered as of greater value than English Beans by one-third, or in other words, three tons of Soya Beans have a feeding value equal to four tons of average English Beans (Smetham, Journ. Roy. Lanc. Agric. Soc. 1909, reprint, p. 5).

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* 5 copecks = 2*d.*; 20 = 7½*d.*,
* pood = 36·114 lbs.

Beans and bean-cake exported from China have gone chiefly to Japan and certain parts of Asia, but recently, beginning about November, 1908, an important trade has been developed in them, more especially with the beans, between Manchuria and Europe, Dalny or Dairen being the chief place of export.

The cause of this sudden development may perhaps be attributed to the facts that a great increase in the cultivation took place in Manchuria during the Russo-Japanese war to meet the demands for food, both for horses and men of the Russian army; then when the troops were withdrawn, the production being found profitable and the home demand reduced, other markets were sought. The trade extended to Japan, and afterwards assisted perhaps by a period of depression in that country, it extended to Europe, where the industry has created interest in many quarters.

The amount sent to Europe through Vladivostok up to July, 1909, of the 1908 crop was 180,000 tons, the greater part for the English market (Hull and Liverpool), and the remainder to German (Hamburg) and Scandinavian ports.

Up to 1907 the export of "Soya Beans" from Manchuria did not exceed 120,000 tons annually. During 1908 the export rose to 330,000 tons (one-half shipped from Darien 100,000 tons from Newchwang, and 65,000 tons by rail *viâ* Suifonho to Vladivostok) the increase it is said being due entirely to the demand from Europe. The total of the 1909 crop exported has been estimated at about 700,000 to 800,000 tons. It is anticipated that at present prices Europe may eventually take at least 1,000,000 tons annually.

It is reported that trial shipments of "bean-cake" have proved that it will not stand a long sea voyage (Cons. Rep. Ann. No. 4529, 1910, p. 27).

Experiments conducted at Oloke Meji go to show that the plant can be cultivated with success, and good results have also been obtained on the Gold Coast. The results of experiments on the Gambia have been disappointing (Col. Rep. Ann. No. 641, 1910, p. 12).

Under cultivation the seeds may be sown broadcast if for fodder, otherwise in drills 1½ to 2 feet or so apart.

The chief requirements are a warm climate, moderate rainfall, good rich soil with a fair amount of lime, and thorough tillage.

The plants before harvesting should not be over ripe, or a loss of beans may result through the opening of the pods.

An average yield is about 50 bushels of beans and about 10 tons and upwards of fodder per acre.

Ref.—"The Soy Bean, *Glycine Soja*," in Food Grains of India, Church, pp. 140–144.——"*Glycine hispida*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 510–511.——"The Cultivation of the Soy Bean (*Soja hispida*)," Turner, in Agric. Gaz. N. S. Wales, ii. Nov. 1891, pp. 648–650.——"*Glycine hispida*," Prain, in Journ. Asiatic Soc. Bengal lxvi. 1897, pp. 403–404.——"*Glycine hispida*," in Field and Garden Crops, Duthie and Fuller, iii. p. 3 (Thomason, Civil Eng. College Press, Roorkee, 1893).——"On the Manufacture of Soy and Bean Curd, in Dip. and Cons. Report, Ann. No. 1212, 1893, p. 10.——"*Glycine hispida*," Irish, in 12th Rep. Missouri Bot. Gdn. 1901, pp. 147–148.——"Soy and Bean Cheese," in Agric. Bull. Straits and Fed. Malay States, iii. 1904, pp. 494–496.——The Soy Bean as a Forage

Crop, Williams, with an Appendix "Soy Bean as Food for Man," Langworthy, U.S. Dept. Agric. Farmers' Bulletin, No. 58, 1899, pp. 1–24; Abstract in Agric. News, Barbados, 1908, p. 403. ——"The Soya or Soy Bean, in Queensland Agric. Journ. xvi. 1906, pp. 546–547, abstract from "The Soya (or Soy) Bean," MacMillan, in Trop. Agric. Ceylon, xxv. 1905, pp. 682-683.——"Utilisation of Soy Bean," in Bull. Imp. Inst. 1907, pp. 86–87.——Soy Bean Varieties, Ball, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 98, 1907, pp. 1–28, illustrated.——"*Glycine Soja*, Soy Bean," in Comm. Prod. India, Watt, pp. 564–565. ——"The Soy or Soya Beans (*Glycine hispida*)" in Tropical Life, Nov. 1909, p. 181.——Cultivation and Uses of Soya Beans, Edie, Inst. Comm. Res. in the Tropics, Liverpool, Bull. No. 1, 1909, pp. 1–7.——Soy Beans, Piper & Nielson, U.S. Dept. Agric. Farmers' Bull. No. 372, 1909, pp. 1–26.——"Cultivation and Utilization of the Soy Bean," in Bull. Imp. Inst. vii. 1909, pp. 308–314, with analysis of Seed and Oil.——"Beans," in Dip. and Cons. Report Ann. No. 4386, 1909, Trade of China, pp. 57–58.——"Soya Bean Traffic," in U.S. Cons. Rep. Washington, Dec. 1909, pp. 65–67.——"Soya Beans or China Oil Beans," in Some New Feeding Stuffs and their Relative Value as Cattle Foods, Smetham; Reprint, Ann. Journ. Royal Lancashire Agric. Soc. 1909, pp. 4–7.——"Export Trade of North Manchuria in Wheat and Beans," Board of Trade Journ. 22nd July, 1909, p. 180.——"Bean Crop of Manchuria," l.c. 26th Aug. 1909, pp. 423–424.——"Die Soja-Bohne," Der Tropenpflanzer, xiii. 1909, pp. 388–390.——"The Soy Bean," Jones, in Agric. News, Barbados, 1909, p. 222.——"Soya Bean Trade of Manchuria," Board of Trade Journal, 3rd Feb. 1910, pp. 233–234.——"Soy Beans and Soy Bean Oil (*Glycine hispida*): Can Soya Bean be used for Paint-making," Tropical Life, Feb. 1910, p. 25.——"Soya Bean Crisis: Rise in Price and Short Crop Cause of Financial Disturbance," Williams, in U.S. Cons. Rep. Washington, March 1910, pp. 62–63.——"Cultivation and Utilisation of Soy Bean," in Bull. Imp. Inst. viii. 1910, pp. 40–42.

ERYTHRINA, Linn.

Erythrina indica, *Lam.* Encycl. ii. p. 391.

A tall deciduous tree. Bark grey, covered with small prickles, ultimately falling off. Leaflets entire, glabrous. Flowers bright scarlet, in dense racemes. Pod torulose, 6–12 in. long, 3–8 seeded. Seeds, black or brown.

Ill.—Rheede, Hort. Mal. vi. t. 7; Wight, Ic. Pl. Ind. or. t. 58.

Indian Coral Tree; Mochi Wood (India, *Watt*); Moorka Tree or Mootchie Wood (India, *Wight*).

Lagos, Botanic Station. Common in India, Burma, Malay Peninsula and Polynesia, &c.

In India the bark is used in dyeing and tanning, and medicinally as a febrifuge, &c. The fresh juice of the leaves is used as an injection into the ear for the relief of earache and as an anodyne in toothache. The tender leaves are eaten in curry, and the leaves used as cattle fodder (Dict. Econ. Prod. India).

The wood is light and soft, weight 18–26 lbs. per cubic foot, fairly durable; used for making scabbards, sieve frames, planking, jars for household purposes, and boxes to be covered with lacquer (Gamble, Man. Ind. Timb. p. 242); poles of palanquins and catamarans (Dict. Econ. Prod. India).

Propagates readily from seed or cuttings, and grows quickly. Cultivated in India as a support for the betel pepper (Gamble, l.c.), Adapted for making hedges, for ornamental purposes, and the loppings are valuable as green manure.

Erythrina lithosperma, *Blume* ex *Miq.* Flor. Ind. Bat. i. p. 209.

A tall tree, with prickly stem. Branchlets often unarmed. Leaflets membranous, glabrous, greenish, the end one roundish, acute, 4–6 in. long. Racemes pilose, contemporaneous with the leaves. Calyx velvety, $\frac{1}{4}$–$\frac{3}{8}$ in. long, finally splitting down nearly to the base in two lips. Standard 1$\frac{1}{4}$–1$\frac{1}{2}$ in. long; the limb, oblong, obtuse; keel and wing sub-equal, $\frac{1}{2}$ in. long. Pod much recurved, 4–5 in. long, broader in lower half, with a stalk reaching 1$\frac{1}{2}$–1$\frac{3}{4}$ in. long. (Fl. Brit. India, ii. p. 190).

Ill.—Vidal, Fl. For. Filip. t. 41a; Brandis, Indian Trees, p. 228, f. 97.

Vernac. names.—Dadap; Mienjak (Buitenzorg, *Greshoff*); Yekathit (Burma, *Gamble*).

Native of Burma and Malaya; distributed to Java, the Philippines, &c.

Grown as a shade tree in Java, Ceylon, &c. The loppings are utilized for green manure, said to yield after five months as much as 4000 lb., or after 12 months, about 15,000 lb. per acre of fresh green material; containing 0·85 per cent. of nitrogen in the fresh state, the equivalent of about 2100 lb. of castor cake per acre per year (Bull. Imp. Inst. 1906, p. 124.)

The bark is used in medicine in Buitenzorg (Mus. Kew).

May be propagated readily from cuttings (4 or 5 feet long) or seeds. Cuttings will make fairly good trees in little more than six months, and come to maturity in about two years.

Erythrina senegalensis, *DC.*; Fl. Trop. Afr. II. p. 181.

Ill.—Ralph, Ic. Carp. t. 32 f. 9 (*E. guineensis*), Pobéguin, Fl. Guin. Franç. t. 51; Chevalier, Les Veg. Util. L'Afriq. Trop. Franç. Fasc. iii. t. 6 (Photo-micrographs of wood sections).

Vernac. names.—Logun-sese (Lagos, *MacGregor*); Ologun wun sheshe (Lagos, *Foster*); Esanigbakehe (Benin, *Dennett*); Jinjiria (Hausa, *Parsons*); Telimu (Sierra Leone, *Scott Elliot*); [Houndieul (Ouloff); Serou (Malinké); Fousente-Farate (Diola) *Chevalier*].

Lagos; Old Calabar; Asaba; Kontagora; Borgu; and widely distributed in West Africa.

Bark used by the Natives, East Africa (Kirk. Herb. Kew). A medicine for small children, Sierra Leone (Scott Elliot, Herb. Kew).

The wood is soft, readily attacked by insects, and when freshly cut emits a strong and objectionable odour. It is white, fibrous, with a red heart; used for making light planks (Chevalier, Les Veg. Util. L'Afr. Trop. Franç. iii. p. 108).

Grown as hedges or palisades.

Grows freely from cuttings (strong shoots or stout pieces of the branches).

Found in wooded places, Kontagora (Dalziel, Herb. Kew); on laterite hills, Sierra Leone (Scott Elliot, Herb. Kew); sparingly in stony country, and also in the Manghi Hills, Bornu (Parsons, Herb. Kew); common in the scrubby lands of Borgu where it is also planted over graves by the natives (Barter, Herb. Kew).

Ref.—"*Erythrina senegalensis*," in Les Vegetaux Utiles de L'Afrique Tropicale Française, Chevalier, Fasc. iii. pp. 105–108, illustrated (A. Challamel, Paris, 1907.)

Erythrina suberifera, *Welw.*; Fl. Trop. Afr. II. p. 183.

Vernac. name.—Molungo (Golungo Alto, *Welwitsch*).

Angola.

Bark and root reputed by the Natives of Angola as an efficient remedy for secondary syphilis, used in the form of a decoction, to which the same virtues are attributed as to Sarsaparilla.

The trunk resists the forest fires, renewing its branches after being burnt nearly to the heart.

Flowers in Golungo Alto twice a year, and is strongly recommended to Horticulturists (Hiern. Cat. Welw. Afr. Pl. i. p. 250).

Erythrina umbrosa, *H. B. & K.* Nov. Gen. et Sp. Pl. vi. p. 434.

Tree furnished with recurved prickles; branches scattered, pendulous; young branches thick, nearly round, smooth glabrous. Leaves with long petioles, ternate; leaflets petiolate, sub-acuminate base truncate-rotundate, entire, reticulate, trinerved, primary nerves and veins prominent on the underside, membranous, glabrous deep-green and shining above, paler below, terminal leaflet remote from the lateral ones, equal-sided, almost deltoid, lateral lobes rotundate 6½ in. long, 6 in. broad, the lateral ones smaller, unequal-sided, deltoid-ovate, 5–5½ in. long; petiole about 5 lin. long, glabrous; common petiole terete, channelled on the upper side, glabrous, 7–8 in. long. Spikes solitary, on subterminal branchlets, pedunculate, pendulous, about 7 in. long; peduncle terete, glabrous. Flowers few, 2½ in. long. Calyx campanulate, divided above; lobes acute, veined, coloured, glabrous, ½-in. long, persistent. Corolla glabrous; petals sessile; standard very long, (2½–2¾ in.) linear cuneate, rounded at the apex, emarginate, very acute at the base, scarlet, 9 lin. broad in the upper part. Stamens 10, in two bundles. Ovary tomentose. Pod 8–12 in. long, torulose, beaked, many seeded. Seeds ovate-oblong in outline.

Vernac. names.—Bucare, Madre de Cacao, Bois immortelle (Porto Rico and S. America, *Cook & Collins*).

Botanic Garden, Old Calabar.

Grown in many tropical countries as a shade tree for Cacao (*Theobroma Cacao*).

Cultivation as under E. *indica*, *lithosperma*, &c.

MUCUNA, Adans.

Mucuna aterrima, *comb. nov.*

[*Stizolobium aterrimum*, Piper & Tracy, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 179, 1910, p. 18.]

An annual. Vine very strong and vigorous, the stem striate but scarcely furrowed, covered with a soft, sparse pubescence. Leaflets very large, plane, mostly acute, strongly mucronate, sparsely appressed—pubescent on each side. Racemes pendent, 1½–2½ ft. long, many flowered; flowers purple; calyx not saccate, densely appressed—pubescent without and within; pods falcate, about 4 in. long, black when mature, sparsely covered with a short, white, appressed pubescence; median ridge on valves, prominent but sometimes broken; secondary ridge faint or wanting; seeds 4 or 5, oblong, black, very shiny, about ½ in. long. the prominent hilum white.

Ill.—Queensland Agric. Journ. iii. 1898, tt. 42, 43 (*Mucuna pruriens*, var. *utilis*); Agric. News Barbados, 1909, p. 154, f. 20 (Lime Trees covered by Bengal Bean); Piper and Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 179, 1910, t. 4, f. B. (pod and seeds), t. 7.

Vernac. names.—Pois Mascate (Reunion, *Nash*, *Cordemoy*); Pois noir de Bourbon (*Voigt*); Mauritius Bean; Bengal Bean; Black Mauritius Bean.

Grown for green manuring in Barbados, and in Hawaii (Piper and Tracy, l.c. p. 19). Used as a fodder plant in Reunion (Nash, Mus. Kew). Gives a good yield of nutritious forage; cultivated as a rotation crop on sugar estates in Mauritius (Kew Bull. 1898, p. 208).

Grows freely and quickly from seed.

In Montserrat the Bengal Bean has been grown with some success over lime trees, to destroy scale insects. Four or five beans are planted around each tree at the beginning of the rains. After about 9 or 10 months when the beans are ripe they are cut off near the ground; any portion of the vines which hang loose on the tree is also cut away, but no attempt is made to remove the mass of vines with which the trees have become overgrown. In a short time the lime trees make strong and vigorous growth, and show a marked improvement in general health. One drawback to the method is that the crop of limes is small for the year the trees are under treatment (Agric. News, Barbados, 1909, p. 154).

Ref.—"The Black Mauritius Bean" (*Mucuna pruriens*, var. *utilis*), Benson, in Queensland Agric. Journ. iii. 1898, pp. 151–152.——"The Use of the Bengal Bean in Lime Cultivations," in Agric. News, Barbados, viii. 1909, p. 154.

Mucuna Deeringiana, *comb. nov.*

[*Stizolobium deeringianum*, Bort, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 141, Pt. 3, 1909, p. 31].

An annual, herbaceous, climbing vine, sometimes 60 ft. in length when growing on supports, and even on the ground attaining a length of from 6–18 ft., bearing long pendant racemes of purple flowers which produce dark, velvety pods 2 or 2½ in. long. Stems rather slender, terete, sparsely pubescent, with white, appressed hairs especially on the ridges. Petioles equalling or exceeding the leaflets, pubescent like the stem, and continued for ¾ to 1½ in. beyond the lateral leaflets; stipules subulate, pubescent, about 5 lin. long; stipels similar but smaller; petiolules about 2–3 lin. long, stout, very pubescent. Leaflets rhomboid-ovate, the lateral ones oblique, membranaceous, acuminate-cuspidate 2–6 in. long, about half as broad, sparsely pubescent above, especially on the veins, more densely pubescent beneath, the white hairs closely appressed. Inflorescence a raceme or thyrsus 6–12 in. long, pendent, bearing 5–30 flowers, usually about 12; rachis like the stem, but more pubescent; flowers borne singly or in twos or threes on short lateral branchlets. Bracts lanceolate-subulate, very pubescent, early fugacious. Calyx pubescent within and without with short, white, appressed hairs, 2 lipped, the upper lip broadly triangular, the lower lip 3 cleft, the lobes triangular subulate, the middle one longest; stinging hairs absent. Corolla dark purple, about 1½ in. long; standard less than half the length of the keel, darker than the rest of the flower; wings slightly shorter than the keel, rather broad, oblanceolate-oblong, obtuse; keel straight to near the tip, where it curves sharply upward, the tip firm and acute; anthers of two sorts, alternately long and short, the latter on much broader filaments; ovary linear, pubescent; style filiform, pubescent nearly to the tip; stigma small. Pods when mature 2–2½ in. long, turgid, densely covered with a soft, nearly black, velvety pubescence, without stinging hairs; valves with 1 or 2 or sometimes 3 obscure longitudinal ridges. Seeds 3 to 5 in each pod, subglobose, marbled and speckled with brown, or black, and sometimes both, on ash-grey ground color (though pure grey and, it is said, pure black occur rarely), about ½ in. in diameter. Hilum white, oblong-crateriform, less than one-half the length of the seed (Bort, l.c.).

Ill.—Queensland Agric. Journ. ii. 1898, t. 28 (*Mucuna pruriens* var. *utilis*); Kennedy, U.S. Dept. Agric. Div. of Agrostology, Bull. No, 22, 1900, t. 11; Transv. Agric. Journ. iv. 1906, t. 73 (*Mucuna utilis*); Cycl. Amer. Agric. ii. f. 888 (pods) f. 889 (beans) f. 890 (vines supported by corn); Bort, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 141, pt. 3, 1909, p. 30, f. 1 (a cluster of mature pods), tt. 2, 3 (*Stizolobium deeringianum*); Piper and Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 179, 1910, t. 2, f. B. (*Stizolobium deeringianum*; pod and seeds).

Velvet Bean: Florida Velvet Bean; Pea Banana (Queensland Agric. Journ. i. Aug. 1897, p. 97); Field Pea (l.c.); Banana Stock Pea (l.c.).

Widely cultivated in warm countries for fodder—in a green state and as hay, and for green manuring. It is recorded that on a 90-acre field [in Florida] of Velvet Beans 300 cattle valued at 12 dollars (£2 8*s.*) a head were turned to feed it down. The beans cost 2·50 dollars (10*s.*) an acre to raise; the cattle doubled in weight and cleared a net profit of 3600 dollars (£720), and the 90-acre field was left rich enough to grow anything without [other] manure or fertilizer (Queensland Agric. Journ. xiii. 1903, p. 271).

It is considered particularly suitable, as a fodder for young growing animals and for the production of milk (Burtt-Davy, Transv. Agric. Journ. iv. 1906, p. 614).

The beans are fit only for feeding animals, for which purpose they may also be ground into meal, and used like cotton-seed meal.

May be propagated by seed, and comes to maturity in about five months. Requires a hot climate, and grows well on light soil. The seed should be sown in rows, about 3 feet apart each way; about a bushel will be required to sow an acre.

The plants should be cut for hay when in flower and not later than the early formation of the pods.

The weight of green forage has been estimated at 16,680 lbs. per acre (U.S. Dept. Agric. Farmers' Bull. No. 78, 1898, p. 13); of cured hay at 5953 lbs. [Florida] to 8280 lbs. [in Alabama] per acre, and the yield of beans 15 to 25 bushels per acre (Burtt-Davy, l.c. p. 615). In West-Florida an average yield is given as 175 bushels of shelled beans per acre (Queensland Agric. Journ. xii. 1903, p. 361).

In the Philippines good results have been obtained by planting the beans in the same rows with Sorghum and Kaffir corn. The corn supports the beans, until both are cut together for green forage (Philippine Agric. Rev. i. Jan. 1908, p. 33).

Support in some form, trellis or pole, is necessary. A Florida farmer has used poles, 12 feet long, set 3 feet in the ground and 6 feet apart in the bean row ; total cost of cutting, and setting up the poles being £3 per acre (Queensland Agric, Journ. xii. 1903, p. 361).

Ref.—"The Velvet Bean," in Queensland Agric. Journ. i. 1897, pp. 97–98.——"Velvet Bean," in Farmers' Bull. No. 78, 1898, pp. 12–14, U.S. Dept. Agric. with analysis of seeds in air dry condition. ——"The Velvet Bean," Benson, in Queensland Agric. Journ. ii. May 1898, pp. 370–371.——"Florida Velvet Bean," Kew Bull. 1898, pp. 207–208.——The Velvet Bean (*Mucuna utilis*), Smith, U.S. Dept. Agric. Div. of Agrostology, Circ. No. 14, 1899, pp. 1–5.——The Velvet Bean, Duggar, Alabama Agric. Exp. Station, Bull. No. 104, 1899, pp. 109–125. ——"Velvet Bean (*Mucuna utilis*)," Lamson-Scribner, U.S. Dept. Agric. Farmers' Bull. No. 102, 1899, pp. 41–43.——"Velvet Bean" (*Mucuna utilis*) in Co-operative Exp. with Grasses and Forage Plants, Kennedy, U.S. Dept. Agric. Div. of Agrostology, Bull. No. 22, 1900, pp. 65–69.——"Velvet Bean," Miller, Florida Agric. Exp. Station, Bull. No. 60, 1902.——"Velvet Bean (*Mucuna utilis*)," Dodson, Louisiana Agric. Exp. St. Bull. No. 72, 1902, pp. 48–56.——"Velvet Bean" (*Mucuna utilis*), in Transv. Agric. Journ. iv. 1906, pp. 614–615.——"Velvet Bean" (*Mucuna utilis*), Wall., or *M. pruriens DC.* var. *utilis*, Bailey, Hume, in Cyclop. Amer. Agric. Bailey, ii. pp. 656–658 (Macmillan & Co., Ltd., London, 1907).——"The Florida Velvet Bean and its History," Bort, U.S. Dept. of Agric. Bureau Pl. Industry, Bull. No. 141, pt. 3, 1909, pp. 25–32.——"The Scientific Name of the Florida Velvet Bean," A Criticism, Burtt-Davy, reprint from the South African Journ. Science, Feb. 1910, pp. 163–165.——The Florida Velvet Bean and Related Plants, Piper and Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 179, 1910, pp. 1–26, illustrated.

Mucuna nivea, *DC.* Prodr. ii. p. 406 ; *Wight & Arnott*, Prod. Fl. Ind. Penin. Orient, 1834, p. 255.

[*Mucuna Lyonii*, Merrill, Philippine Journ. Science, Suppl. i. 1906, p. 197, fide Piper & Tracy, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 179, p. 15].

An annual plant, stem and leaves beneath glabrescent. Leaflets $\frac{1}{2}$–$\frac{3}{4}$ ft. long, distinctly rhomboidal at the base, both sides at first with a few adpressed hairs. Flowers white, in long drooping racemes. Pod, 6 in. long, shortly velvety glabrescent ribbed longitudinally, black and destitute of bristles when mature, 6–8 seeded (Fl. Brit. India, ii. (1879), p. 188). Seeds oval, smooth, ash coloured. Piper & Tracy (l.c.) describe the leaf surface as being decidedly undulate and unlike any other species known to them, so that the plant may be readily recognised even before it blooms.

Ill.—Blanco, Fl. Filip, t. 405, bis (*Negretia mitis*) ; Piper & Tracy, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 179, 1910, t. 4, f. A. (pod and seeds).

Vernac. names.—Sabual (Philippines, *Merrill, Piper & Tracy*) ; Khamach, Alkushi (Bengal, *Watt*).—Lyon Bean ; Lyon Velvet Bean (Philippine Agric. Rev. ii. 1909, p. 26).

Burma and Bengal. Introduced to Onitsha, S. Nigeria, from the U.S. Dept. of Agriculture.

According to Piper & Tracy (l.c. p. 16), by removing the exterior velvet-like skin of the large fleshy tender legumes, they are, when dressed like French Beans (*Phaseolus vulgaris*), a most excellent vegetable for the table, and the full-grown beans are scarcely inferior to the large garden beans of Europe.

Watt also states (Dict. Econ. Prod. India) that this plant is cultivated during the cold season for the sake of its abundant and useful fruit; the large, fleshy, tender legumes have long been known and valued as a vegetable by the Hindus, and are a most excellent vegetable for European tables.

In the Philippines this bean is considered more satisfactory than the Velvet Bean, by reason of the more vigorous growth, greater production of forage, and the abundance of easily harvested seed (Philippine Agric. Rev. i. 1908, p. 76, *Mucuna Lyonii*).

Cultivation as for the Florida Velvet Bean, taking about the same or somewhat less time to mature.

At Singalong, in the Philippines, plants after five months have been found to yield seed at the rate of 2,200 kilos per hectare. The beans are not easily separated from the pod without machinery (l.c. ii. 1909, p. 26).

Mucuna pruriens, *DC.*; Fl. Trop. Afr. II. p. 187.

Ill.—Rheede, Hort. Mal. viii. t. 35; Jacq. Ic. Select. Stirp. Am. t. 122 (*Dolichos pruriens*); Plenck, Ic. t. 556 (*Dolichos pruriens*); Wight, Illust. t. 13; Hook. Bot. Misc. ii. (1831) Suppl. t. 13; Woodville, Med. Bot. iii. t. 153 (*Dolichos pruriens*); Steph. & Ch. Med. Bot. iii. t. 179 (*Dolichos pruriens*); Mag. Bot. & Gard. i. (1833), t. 17, f. 4; Bot. Reg. (1838), t. 18; Mart. Fl. Bras. xv. pt. 1, t. 46, f. 2; Fl. des Serres, t. 2026; Blanco, Fl. Filip. t. 331 (*Negretia pruriens*); Bentl. and Trimen, Med. Pl t. 78; Engl. and Prantl, Pflan. iii. pt. 3, f. 131 F-K; Pharm. Journ. [4] xiii. p. 272 (pods and seed; hairs—enlarged).

Vernac. names.—Esisi (Lagos, *Dawodu*); ? Yerepe (S. Nigeria, *Foster*); Karrara (Kontagora, *Dalziel*); N'gagna (Gambia, *Brown-Lester*). Picapica (Spanish, *Safford*); Nipay (Philippines, *Safford*); Petit pois pouilleux (French, *Planchon and Collin*).—Cowhage or Cow-itch; West Indian Cow-itch plant.

Lagos; Nupe; Zungeru; Abokam, Ikum, Ikor-Ofion and Umon, Cross River; and cosmopolitan in the Tropics.

The young and tender pods are cooked and eaten as a vegetable in India (Dict. Econ. Prod. India).

The hairs of the pods are a mechanical irritant; used in medicine as an anthelmintic, made up as an electuary with treacle, syrup and honey, &c. A vinous infusion of the pods is said to be a certain remedy for the dropsy (Lunan, Hort. Jamaica, p. 244).

An infusion of the roots is used as a cure for cholera in India (Bentl. and Trimen, Med. Pl. ii. No. 78); and a decoction of the root is said to be diuretic (Fawcett, Econ. Pl. Jamaica, p. 55). Various other medicinal virtues are attributed to the root and seeds in India (*see* Watt, Dict. Econ. Prod. India).

The plant is an annual, and may be propagated readily from seeds. It has been found growing on the banks of the Ogun River (Millen, Herb. Kew); in open places where the land has been cultivated, Nupe (Barter, Herb. Kew); twining on shrubs and in ravines Zungeru (Dalziel, Herb. Kew); climbing over bushes in rice swamps Sierra Leone (Scott Elliot, Herb. Kew); plentiful near Ikor-Ofion and Umon, Cross River (Billington, Rep. on Exped. to Cross River, Africa, No. 1, 1895, p. 30), and at Itu (l.c. p. 32).

There is not a large demand for the pods for medicinal purposes, and the stinging hairs make it an undesirable object to deal with under cultivation for any other purpose. In Jamaica, peasants "when asked to clear a piece of bush in which cowhage may be growing are willing to do so if allowed to burn the bush, but not otherwise," (Wardleworth, Year Book Pharm. 1900, p. 423).

Ref.—" Setæ Mucunæ," in Pharmacographia, Flückiger and Hanbury, pp. 189–190 (Macmillan & Co., London, 1879)——" *Mucuna pruriens*" in Med. Pl. Bentley & Trimen, No. 78.——" *Mucuna pruriens*" in Dict. Econ. Prod. India, Watt, v. 1, 1891, pp. 286–287. ——" *Mucuna*," in Pharm. Journ. [4] xiii. 1901, p. 272.

Mucuna urens, *DC.*; Fl. Trop. Afr. II. p. 185.

Ill.—Tuss. Ant. ii. t. 13 (*Negretia urens*); Mart. Fl. Bras. xv. pt. 1, t. 46, f. 1.

Vernac. names.—Ojo de Buey; Matos (Porto Rico, *Cook & Collins*); Grand pois pouilleux; Oeil de bourrique (French, *Planchon & Collin*, *Tussac*).—Ox-eye-bean; Horse-eye-bean; Cali Nuts.

Common throughout West Africa. Cosmopolitan in the Tropics.

The seeds are used in America as a diuretic, and in decoction as a soothing application to hemorrhoids (Planchon & Collin, Les Drog. Simpl. ii. p. 542). In the West Indies they are used for decorative purposes. They have occasionally appeared as a substitute or, more properly, as an adulterant of the Calabar Bean (*Physostigma venenosum*).

CANAVALIA, Adans.

Canavalia ensiformis, *DC.*; Fl. Trop. Afr. II. p. 190.

Ill.—Rheede, Hort. Mal. viii. t. 44 (*C. incurva*); Jacq. Ic. Pl. Rar. iii. t. 559 (*Dolichos acinaciformis*); Wight, Ic. Pl. Ind. Or. iii. t. 753; Bot. Mag. t. 4027; Schweinf. Reliq. Kotschyanae, tt. 20, 21 (*C. polystachya*); Sinclair, Fl. Hawaii t. 6 (?); Church, Food Grains, India, p. 415; Duthie, Field Crops, t. 71;

Vernac. names.—Poponla (Lagos, *MacGregor*); Popondo (Lagos, *Dawodu*); Popondo (Oloke-Meji, *Foster*); Puakani (Hawaii, *Sinclair*); [Akankan (Guam), Palangpalang (Philippines) Safford]; Sembara (Saharunpur, *Duthie*); Aka Natamame or Shiro Natamame (Japan, *Veitch*);——Sword Bean; Horsebean; Snakebean; Patagonian Bean; Overlook Bean.

Lagos; Oloke-Meji; Nupe, and Cosmopolitan in the Tropics.

In India a preparation of the leaves burnt in mustard oil is used as an ointment (Duthie, Field Crops, iii. p. 1). Cultivated in many parts for the sake of the pods, which when young and tender are said to be scarcely inferior to French beans (Duthie, Field Crops, iii. p. 1). The white-flowered and white-seeded varieties are considered the best for this purpose (Firminger, Man. Gard. Bengal, ed, 4, p. 156; Watt, Comm. Prod. India, p. 248). The young and half-grown pods are also eaten especially in curry by the natives of India, and the mature seeds are eaten (Watt, l.c.). The mature beans roasted and ground have been used in Texas as a substitute for coffee; they are indigestible unless deprived of their outer skin. Experiments have proved these beans to be unsuitable for feeding stock (Lloyd & Moore, Mississippi Bull. No. 39, 1896, p. 166; Safford. Pl. Guam, p. 211). The seeds are used by some as food and given to fatten hogs in Jamaica (Bot. Mag. l.c.).

The natives on the Nile at Chopeh amuse themselves at a game with the seeds, which they spin upon their wooden stools (Grant, Trans. Linn. Soc. xxix. p. 60).

Grown from seed, which may be sown in rows about two to three feet apart, and about one foot apart in the rows. Cultivation easy.

In the N.W. Provinces and Oudh it is sown around the edges of fields, and is frequently to be seen climbing on palings as well as over the roofs of native houses (Duthie, Field Crops. iii. p. 1).

Ref.—"The Sword Bean (*Canavalia ensiformis*)," Burtt-Davy, in Transv. Agric. Journ. v. 1907, pp. 452-453.

Canavalia obtusifolia, *DC.* ; Fl. Trop. Afr. II. p. 190.

Ill.—Rheede, Hort. Mal. viii. t. 43 ; Jacq. Pl. Rar. Hort. Caesarei Schoenb. ii. t. 221 (*Dolichos emarginatus*) ; Cleghorn, Madras Journ. N.S. i. t. 4 ; Vellozo, Fl. Flum. vii. t. 160 (*Dolichos littoralis*) ; Mart. Fl. Bras. xv. pt. 1, t. 48 ; Wettstein, Veg. Südbras. t. 14 ; Banks & Solander, Bot. Cook's Voy. i. t. 74 (*Canavali maritima*).

Vernac. names.—Ipongo (*Batanga*, *Bates*) ; [Palang-palang (Philippines), Akankan tasi (Guam) Mata de la Playa (Porto Rico), Mata de Costa (Cuba) *Safford*] ; Katra Shim (Bengal, Mus. Kew).

Niger ; Brass, and widely distributed on tropical shores.

Useful as a binder of loose sand.

Banks & Solander state that it was eaten as a kind of bean by the members of Cook's Expedition, with the remark "very bad" (Bot. Cook's Voyage, i. p. 24).

Found growing on the shore of the Brass river (Barter, Herb. Kew) ; running far in beach tangle, and down over the bare sand, sometimes on sandy ground back from the beach, common, Batanga (Bates, l.c.) ; common on the seashore (Ayres & Bouton, l.c.) ; associated with the "goats foot convolvulus" (*Ipomoea Pes-caprae*) in Guam (Safford, Pl. Guam, p. 211.)

BUTEA, Roxb.

Butea frondosa, *Roxb.* Pl. Corom. i. p. 21.

An erect tree 40 to 50 ft. high, shoots clothed with grey or brown silky pubescence. Petiole ¼-½ ft. ; leaflets 4–8 in. long, coriaceous, glabrescent above, densely finely silky and strongly veined below. Terminal leaflet roundish, base rhomboid, obtuse, often emarginate. Racemes 6 in. long ; pedicels ½–1 in., densely brown-velvety. Calyx ½ in. long, velvety. Petals bright orange-red, equal, thickly clothed on the outside with silvery tomentum, the standard 1 in. broad, the keel semi-circular beaked. Pod 6–8 in. by 1½–2 in. silvery-canescent, narrowed suddenly into a stalk longer than the calyx (Fl. Br. India, ii. p. 194).

Ill.—Rheede, Hort. Mal. vi. tt. 16, 17 ; Roxb. Pl. Corom. t. 21 ; Hayne, Darst. Beschr. Gewäche, x. t. 6 ; Hook. Bot. Misc. iii. (1833) Suppl. t. 32 ; Nees von Esenbeck, Plant. Medic. Düsseld. Suppl. i. t. 10 ; Nooten, Fl. Java, t. 6 ; Bedd. Fl. Sylv. t. 176 ; Bentl. & Trimen, Med. Pl. t. 79 ; Karst. & Schenck, Veg. bild. iii. t. 14 ; Indian Forester, xxxiv. 1908, t. 15 (abnormal type).

Vernac. names.—Palas or Plas, Dhak (India, *Watt*, *Bentley & Trimen*). Butea Gum ; Bengal kino ; Bastard Teak.

Introduced to Botanic Garden, Old Calabar (1898), from Kew. Common in India and Burma.

A valuable tree for recovering salt lands, and next to *Schleichera trijuga*, the most important one for the development of the lac insect (Gamble, Man. Ind. Timb. p. 244). Yields a gum of an intense ruby colour and astringent taste; used in India as a substitute for true kino (*Pterocarpus Marsupium*), as a dye and tan, and it is said to be used by the natives to purify and precipitate blue indigo. The bark yields a fibre used in India for rough cordage and for caulking boats (Watt, Comm. Prod. India, p. 189). The leaves are used as plates, especially in S. India; as a substitute for paper, and as fodder for buffaloes; the flowers yield a bright yellow dye though not of much value; the dye is not permanent, and its use appears to be confined to India. The seeds pounded with lemon juice are a powerful rubefacient (Watt, l.c. p. 190), and they are used in medicine as a purgative and vermifuge (Gamble, Man. Ind. Timb. p. 243).

The wood is more durable under water than above ground; used in Upper India for well-curbs and piles, water scoops of native wells (Gamble, l.c. p. 244), gunpowder charcoal and building purposes (Beddome, Fl. Sylv. t. 176).

Propagated by seeds. Thrives on black cotton-soil, also in salt lands and in water-logged places. In India, Burma and Ceylon it occurs on the plains, usually in open country, in grass lands and gregarious (Gamble, l.c.), and it occurs in the hills up to about 4000 feet (Watt, l.c. p. 189).

The brilliant orange flowers which appear before the leaves make this plant a very attractive one for decorative purposes.

Ref.—"Huile de *Butea frondosa*," in Ann. L'Inst. Col. Marseille, v. 1898, fasc. 2, pp. 94–99.——"*Butea frondosa* (*Erythrina monosperma*, Lamk.)," De Cordemoy, in Ann. L'Inst. Col. Marseille, vi. 1899, fasc. 2, pp. 76–82.——"*Butea frondosa*: Dye," in Tech. Rep. & Sci. Papers: Imp. Inst. 1903, pp. 218–220.——"*Butea frondosa*" in Manual Indian Timbers, Gamble, pp. 243–244.——"Dhak or Butea," Burkill, in Agric. Ledger, No. 2, 1908, pp. 14–16.——"*Butea frondosa*" in Comm. Prod. India, Watt, pp. 189–190.

PHYSOSTIGMA, Balfour.

Physostigma cylindrosperma, *E. M. Holmes* in Pharm. Journ. [3], ix. 1879, p. 913. [*Mucuna cylindrosperma*, Welw. ex Baker in Oliv. Fl. Trop. Afr. ii. p. 186].

Ill.—Pharm. Journ. l.c. (seed); Pharm. Journ. [4] xi. 1900, p. 461 (seed); *Ibid.* 1904, p. 699.

Vernac. names.—Maxim ia muxito (Golungo Alto, *Welwitsch*).

The seeds of this plant occur mixed with true Calabar bean (*seq.*) in commerce, from which they differ by being nearly or quite cylindrical, somewhat longer and redder in colour.

This plant has not been recorded from Nigeria, but for the reason above mentioned it is not unlikely that the two plants may be found together in some parts, though the species under consideration does not appear to have been found further north than Angola.

Ref.—*See* under *P. venenosum.*

Physostigma venenosum, *Balfour*; Fl. Trop. Afr. II. p. 191.

Ill.—Trans. Roy. Soc. Edin. xxii. pt. 2, 1860, tt. 16–17: Bentl. & Trimen, Med. Pl. t. 80; Engl. & Prantl, Pflan. iii. pt. 3, f. 134 (after Bentl. & Trimen); Köhler, Med. Pflan. iii.; Pharm. Journ. as under *P. cylindrosperma.*

Vernac. names.—Isho (Lagos, *Dawodu*); Esere (Old Calabar, *Moloney*, *Hutchinson*, *Holland*).—Calabar Bean, Ordeal Bean.

The bean is very poisonous; the active principle is "Eserine" and Stigmasterin (*see* Pharm. Journ. [4] xxiv. 1907, p. 331); used medicinally for ophthalmia, &c. In Old Calabar it was formerly used as an ordeal with a view to the detection of crime—innocent by recovery, guilty by fatality from a dose,——but its use in this respect is now prohibited by law.

The commercial demand is somewhat limited, and uncertain. The price originally was 4*s.* to 5*s.* per lb. (Wardleworth, Pharm. Journ. [3] xxii. 1891, p. 439), and at the present time the beans are sold at from about 2*d.* per lb. (Chemist and Druggist, June 11th, 1910, p. 62).

The shipments are sometimes mixed with the seed of *Mucuna urens*, which is easily distinguished by the circular form and the broad flat hilum running almost half way round the seed.

Ref.—"Description of the Plant which produces the Ordeal Bean of Calabar," Balfour, in Trans. Roy. Soc. Edinburgh, xxii. pt. 2, 1860, pp. 305–312.——"Note on Calabar Beans," Holmes, in Pharm. Journ. [3] ix. 1879, pp. 913–914.——"The Preparation and Characters of Extract of Calabar Bean," Gibson, in Pharm. Journ. [3] xv. 1885, pp. 593–594.——"Note on Commercial Extract of Calabar Bean," MacEwan, in Pharm. Journ. l.c. pp. 594–595, and pp. 606–607; "The Pharmacognosy and Chemistry of Calabar Beans," MacEwan, l.c. xvii. 1887, pp. 641–643.——"*Physostigma venenosum*" in Med. Pflan. Köhler, iii. 3½ pages.——"Physostigmatis Semina," Pharm. Journ. [4] xi. 1900, p. 461.——"Calabar Bean," l.c. xviii. 1904, pp. 699–700.——"Assay of Calabar Beans," l.c. xxi. 1905, p. 583.

PHASEOLUS, Linn.

Phaseolus aconitifolius, *Jacq.*; Obs. Bot. iii. p. 2.

Perennial or annual. Stems slender, suberect or diffuse, slightly hairy. Stipules lanceolate, leaflets deeply 3-lobed, with the central division ligulate. Racemes capitate. Bracteoles linear. Flowers minute. Pod rather stouter than in *P. trilobus*, and seeds larger (1–2 in. long, 6–12 seeded).

Ill.—Jacq. Obs. Bot. iii. t. 52; Duthie, Field Crops, i. t. 11; Church, Food Grains, India, t. 29.

Aconite-leaved Kidney Bean; Moth Bean.

Botanic Station, Lagos: Found throughout India, Ceylon, &c.

Useful for food, fodder and green manuring. The green pods are used in India as a vegetable. The principal requirements under cultivation, are a deep sandy loam or alluvium, though it will grow on soil comparatively poor; moderate rainfall (about 30 or 40 inches), and a warm climate.

The seed may be sown broadcast, at the rate of about 8 lbs. per acre; a high yield is an average of about eight maunds (656 lbs.) per acre, and a fair yield in an average season may be 120 lbs. of pulse per acre (Watt, Comm. Prod. India, p. 879).

Ref.—"*Phaseolus aconitifolius*" in Field and Garden Crops, Duthie & Fuller, i. p. 41.——"The Moth-Bean" in Food Grains of India, Church, p. 152, with analysis.——"*Phaseolus aconitifolius*," in Dict. Econ. Prod. India, Watt, vi. 1, 1892, pp. 182–186.——*Ibid.* in Comm. Prod. India Watt, pp. 879–880 (John Murray, London, 1908).

Phaseolus adenanthus, *E. Mey.*; Fl. Trop. Afr. II. p. 192.

Ill.—Wallich, Pl. Asiatic Rar. i. t. 63 (*P. rostratus*); Wight, Ic. Pl. Ind. Or. i. t. 34 (*P. rostratus*).

Brass; Katagum. Tropical Africa generally, and cosmopolitan in the Tropics.

The tuberous roots are eaten by the Hindoos; the whole plant is used in gonorrhœa, also in decoction of rice-water in diabetes, &c. The root is scraped, and together with sandal-wood, fresh butter and sugar is used as a liniment for sore eyes (Moloney, For. W. Afr. p. 320, from Useful Pl. India, Drury).

Found as a twiner by streams in Katagum (Dalziel, Herb. Kew), on the sea-shore at Brass (Barter, l.c.), and on the banks of the Bonny River (Mann, l.c.).

Phaseolus lunatus, *Linn.*; Fl. Trop. Afr. II. p. 192.

Ill.—Jacq. Hort. Bot, Vindob, t. 100 (*P. bipunctatus*); Wight, Ic. Pl. Ind. or. iii. t. 755; Ralph, Ic. Carp. t. 31, f. 8; Agric. Gaz. N. S. Wales, iii. 1892, t. 42; Engl. Pflan. Ost. Afr. t. 24, ff. H—J. (pod and seed); Queensland Agric. Journ. iii. 1898, p. 259 (Var *inamoenus*); xi. p. 321; Irish, 12th Rep. Missouri, Bot. Gdn. 1901, t. 38 (Seeds of "Carolina," "Willow Leaf," "Black Lima," "Jackson," "Large White," "Ford," "Burpee," "Speckled," "Dreer" and "Kumerle"); Vilmorin Andrieux, Pl. Potagères, p. 340; Tracy, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 109, 1907, tt. 21, 22 (Bush and Pole var. of Lima bean); Chevalier, Miss. Chari Lac Tchad (1902–04) L'Afr. Cent. Franc. 1908, f. 110.

Vernac. names.—Akpakapakera (Onitsha, *Johnson, Young*); Owega Fufu (Old Calabar); Awuje (S. Nigeria); Pois d'Achery (Mauritius, *Nash, Henckell du Buisson & Co.*); Feijão espadinho (Angola, *Welwitsch*); Kajang Koakara (Java, Mus. Kew).——Lima, Burma, Rangoon, Java or Paigya Beans; small Mauritius Bean; Sugar Bean; Duffin Bean; Butter Beans.

Common in the Tropics: generally cultivated,

The young pods may be cooked like French Beans, and the seeds, more especially the white ones, may be eaten like haricot beans. The plant is an important fodder, and is very suitable for green manuring.

The ripe seeds contain prussic acid, the percentage of which is greater in the coloured seeds than in the white, so much so that the white kinds only are considered safe for food. According to Guignard the percentage of hydrocyanic acid in Java beans ranges from ·06 to ·32 and of red and white Burma beans ·002. The importation of Java beans to Paris is prohibited, but Burma beans are allowed in with a certificate of origin, and provided that analysis shows them to yield not more than ·02 per cent. of hydrocyanic acid (Pharm. Journ. [4] xxiii. p. 489).

Under cultivation there are many varieties which vary, especially in the colour, size and shape of the seeds: they may be white, black, brown, reddish and mottled. The seeds all agree, however, in the lunate, flat or slightly rounded form, with fine lines radiating from the hilum to the outer edge, giving an impression of the radii of a circle; these characters distinguish the seeds from those of the haricot (*P. vulgaris*), which is never flat, and the markings on the seed do not radiate from the hilum, but show a tendency to mottling. The small white seeds of *Phaseolus lunatus* are often sold as small haricots.

Vilmorin-Andrieux (Pl. Potagères, pp. 339–341) describes fourteen varieties. Irish (12th Rep. Missouri Bot. Gard. 1901, pp. 88–93) describes five well-marked varieties under *Phaseolus lunatus*, and seven varieties under *P. lunatus macrocarpus.* These include, among white-seeded forms, "Carolina," an early variety and one of the oldest in cultivation; "Henderson;" "Willow leaf," frequently planted for ornamental purposes; and with black, brown or variegated seeds; "Black Lima," and "Jackson," both objectionable for table purposes because of the colour; "Large White;" Jersey; Burpee, very productive and early, one of the best dwarf Limas; "Speckled;" "Dreer," very productive, medium early and of excellent quality; "Kumerle" and "Challenger."

Ref.—"The Cultivation of the Dwarf or Bush Lima Bean (*Phaseolus lunatus*)," Turner, in Agric. Gaz. N. S. Wales, iii. 1892, pp. 644–647; Sowing, Harvesting and Uses.——"*Phaseolus lunatus*," in Dict. Econ. Prod. India, Watt, vi. 1, 1892, pp. 186–187.——"*Phaseolus lunatus*," Irish, in 12th Rep. Missouri Bot. Garden, 1901: "Garden Beans Cultivated as Esculents," pp. 88–93.——"*Phaseolus lunatus*," in Bull. Imp. Inst. i. 1903, pp. 15-16.——"Rangoon Beans," l.c. pp. 16–17. ——"*Phaseolus lunatus*," l c. pp. 112–115.——"Rangoon, Paigya, or Burma Beans," l.c. p. 115.——"Haricots de Lima, *Phaseolus lunatus*," in Pl. Potagères, Vilmorin-Andrieux, pp. 339–341 (Vilmorin-Andrieux & Cie, Paris, 1904): English Translation, Robinson, pp. 95–97, (John Murray, London, 1905).——"*Phaseolus lunatus*, Lima or Duffin Bean" Dunstan, in Agric. Ledger, No. 2, 1905, pp. 11–16.——"Poisonous Properties of the Beans of *Phaseolus lunatus*," Bull. Imp. Inst. iii. 1905, pp. 373–375.——"Phaseolunatin," l.c. iv. 1906, pp. 334–339, with table showing quantities of prussic acid in various samples of Java, Mauritius, Burma, Provence, and Madagascar Beans. ——"Poisonous Beans," Skinner, in U.S. Cons. Rep. Washington, No. 309, June, 1906, pp. 104–106.——"Poisoning of Cattle by Java Beans," in Journ. Bd. Agric. xii. 1906, pp. 742–746.——"Lima Beans," Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 109, 1907. "American Varieties of Garden Beans," pp. 41–53, with descriptions of 22 varieties.——"The Poisonous Properties of the Beans of *Phaseolus lunatus*," Dunstan & Henry, in Journ. Bd. Agric. xiv. 1908, pp. 722–731.——*Phaseolus lunatus*, in Comm. Prod. India, Watt, p. 880 (John Murray, London, 1908).——"Phaseolunatin," Dunstan, in Col. Rep. Misc. No. 71, 1910, pp. 216–220.

Phaseolus Mungo, *Linn.*; Fl. Trop. Afr. II. p. 193.

Ill.—Duthie, Field Crops, i. t. 10; Agric. Gaz. N. S. Wales, iii. 1892, t. 31; Engl. Pflan. Ost. Afr. t. 24; Banks & Solander, Bot. Cook's Voy. i. t. 75.

Vernac. names.—Chirokko (Tanga, German, E. Africa, Bull. Imp. Inst. i. 1903, p. 126); Urd or Udid (India, *Watt*); Woolly Pyrol (Barbados); Soroko (Shire Valley, *Kirk*); Tawi (Sierra Leone, *Scott Elliot*); [Moñggos (Guam), Muñggo, Moñggo, Balatang (Philippines) *Safford*].

Grown throughout Tropical Africa, India, &c.

The green pods and ripe seeds are used as food and the plant as fodder, and for green manuring. In India it is one of the most important crops.

Soil appears to be of secondary consideration, and, provided drainage, heat and rain are sufficient, the cultivation is easy. The plants come to maturity in little more than two months. An average yield is given at 5 maunds (410 lbs.) of grain and 1,230 lbs. of straw (Watt. Comm. Prod. India, p. 881).

Ref.—"The Cultivation of the Mung Bean (*Phaseolus Mungo*)," Turner, in Agric. Gaz. N. S. Wales, iii. 1892, pp. 390–392 ; Situation, Soil, Sowing, Harvesting.——*Phaseolus Mungo,* in Dict. Econ. Prod. India, Watt, vi. 1, 1892, pp. 187–191.——"Mati-Máh (*Phaseolus Mungo* var. *radiatus*), Basu in Agric. Ledger, No. 5, 1903, pp. 127–131. ——"*Phaseolus Mungo*," in Comm. Prod. India, Watt, pp. 880–881 (John Murray, London, 1908).

Phaseolus radiatus, *Linn.* Sp. Pl. (1753) p. 725.

Herb 1–2 ft. high ; stems annual, erect or sub-erect, branched from the base, sparingly clothed with rather long deflexed hairs. Leaves trifoliate, long petioled ; leaflets membranous, dark green, sparingly pilose, ciliate, 2–4 in. long, lateral unequal-sided, stipules ovate obtuse, about ½ in. long, attached near the base. Racemes axillary, capitate, many-flowered, peduncled. Flowers yellow, about ½ in. long. Pod 1½–2½ in. long, subterete, horizontal, setulose, 10–15 seeded. Seeds small, green, yellow or black.

Ill.—Duthie, Field Crops, i. t. 9 (*Phaseolus Mungo*) ; Church, Food Grains, India, t. 28.

Vernac. names.—Mung (India, *Prain*, *Watt.*) ; Mágu-Máh (Assam, *Basu*) ; Adzuki (Japan, *Nagai*).—Green Gram ; The Mung Pulse.

The grain is used for food ; the grain and straw for fodder, and the plants for green manuring.

In India it is grown as a separate crop, or as a subordinate one with millet or cotton. It requires a deep rich soil ; rainfall of about 30–35 inches, and good tillage. When sown alone 12 to 20 lb. of seed will be required per acre. In Assam 6 to 9 seers (12–18 lb.) (Agric. Ledger, No. 5, 1903, p. 129), in India 12 seers (24 lb.) (Comm. Prod. India, p. 882).

In India it is met with both wild and cultivated throughout the plains, and ascending in parts to 6000 feet.

According to Prain (Journ. As. Soc. Bengal, lxvi. 1897, p. 422), there are three leading varieties of Mung under cultivation in India, the "Múng" or "Chegt Múng" (var. *typica*), seeds green ; "Sona Múng" (var. *aurea*), seeds yellow, the most esteemed form of 'Mung"; and "Krishna Múng" (var. *grandis*), seeds black, the least esteemed form of "Mung."

Ref.—"The Mung Bean," in Food Grains of India, Church, pp. 148–152 "*Phaseolus Mungo*, Linn. var. *radiatus*," in Dict. Econ. Prod. India, Watt, vi. 1, 1892, pp. 191–194.——"*Phaseolus radiatus*," Prain, in Journ. Asiatic Soc. Bengal, lxvi. 1898, pp. 422–423.—— "Mágu-Máh, *Phaseolus Mungo*," Basu, in Agric. Ledger, No. 5, 1903, pp. 131–132.

Phaseolus vulgaris, *Linn.* ; Fl. Trop. Afr. II. p. 193.

Ill.—Rchb. Ic. Fl. Germ. xxii. t. 272 ; Irish, 12th Report Missouri Bot. Gdn. 1901, tt. 38 to 43 (seeds of 133 varieties), t. 45, f. 1 (pods) ; Vilmorin Andrieux, Pl. Potagères, p. 289 (pods of 11 varieties), pp. 291–336 (figs. of 51 varieties) ; Tracy, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 109, 1907, tt. 1–20.

Vernac. names.—Ebyjanjaro (Uganda, *Dawe*) ; Makōkōle, Mamrondo, Kavirondo, Makaragwe (E. Africa, *Engler*).——Kidney Bean ; Haricot Bean ; French Bean.

Cultivated as a vegetable in many parts of the world; Uganda (Dawe, Report Bot. Miss. Uganda, 1906, p. 43); Angola (Hiern. Cat. Welw. Afr. Pl. i. p. 191); has done well in Old Calabar.

In Angola there are more than 25 varieties differing in shape, colour and size of seed; the best is an elliptical, thin-skinned, white variety (Hiern l. c.)

Irish (12th Report Missouri Bot. Gdn. l. c.) describes 136 varieties: "Navy" is the one from which the famous "Boston baked beans" are prepared; the pods are very inferior for cooking purposes, but the seed is much used in baking and for stock food; it is grown largely as a field crop in America; "Triumph" is very early and productive. "Black Speckled" is extensively grown around Paris (as "Haricot de Bagnolet," Vilmorin Andrieux, Pl. Potagères, p. 306): "Dwarf Case Knife" is very productive. "Golden Cranberry" is said to be universally cultivated. "Canadian Wonder," a dwarf vigorous plant is one of the best for producing a good crop. "Ne plus ultra" is a well known variety grown in gardens in this country.

Many other varieties might be mentioned, including early, medium and late, but Vilmorin Andrieux (Pl. Potagères, Paris 1904) describe 188 varieties, and most nurserymen have their specialities to recommend. In the Museum at Kew there are specimens of the seeds of upwards of 200 varieties.

The seeds may be white, black, yellow, brown, red, and in various shades of these colours, or variegated.

Sow in rows about 2 to 3 feet apart, the beans 8 or 9 inches apart in the rows and about one inch deep. The seeds germinate in a few days and the plants begin to bear in the course of a month or six weeks.

A light rich soil in an open situation, with protection (light shade) from excessive sunlight suits this plant. The dwarf varieties require no support, but the taller growing sorts must be kept off the ground.

Ref.—"Haricot Beans," in Food Grains of India, Church, p. 147, with analysis——"*Phaseolus vulgaris*, the Kidney, French, or Haricot Bean," in Dict. Econ. Prod. India, Watt, vi. 1, 1892, pp. 194–195.——"*Phaseolus vulgaris*," Irish, in 12th Report, Missouri Bot. Gdn. 1901: "Garden Beans Cultivated as Esculents," pp. 93–142. ——"Haricot, *Phaseolus vulgaris*," in Pl. Potagères, Vilmorin Andrieux, pp. 285-337 (Paris, 1904); English translation: "The Vegetable Garden," Robinson, pp. 32–90 (John Murray, London, 1905). "Kidney Beans (*Phaseolus vulgaris*)," Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 109, 1907: "American varieties of Garden Beans," pp. 53–133, with descriptions of 138 varieties, illustrated.

VIGNA, Savi.

Vigna Catjang, *Walp.* in Linnaea, xiii. (1839) p. 533 [*V. sinensis*, Endl.; Fl. Trop. Afr. ii. p. 204.]

Ill.—Bot. Mag. t. 2232 (*Dolichos Catiang*); Church, Food Grains, India, t. 30; Duthie, Field Crops, tt. 29, 30; Engl. & Prantl, Pflan. iii. pt. 3, f. 136 J-M; Agric. Gaz. N. S. Wales, iii. Nov. 1892, t. 54; Engl. Pflan. Ost Afr. t. 24, ff. F-G (*V. sinensis*, pod and seed); Journ. Dept. Agric. W. Australia, iv. Oct. 1901, p. 241; Irish, 12th Report Missouri Bot. Gdn. 1901, t. 44, f. 11 (var. *Mongette*), f. 12

(var. *Tonkin*); Bull. Econ. Indo-Chine, 1905, p. 1171 (*V. sinensis*, var.) and p. 176; Wight, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 102, pt. 6, 1907, tt. 1–3; Cycl. American Agric. ii. 1907, p. 264, f. 371 (*V. unguiculata*); Nielson, U.S. Dept. Agric. Farmers Bull. No. 318, 1908, p. 8, f. 1 (plant with ripe pods).

Vernac. names.—Ere (Lagos, *Thompson*); Igara (Onitsha, *Johnson*, *Young*); Ewa-dudu, (S. Nigeria); Adouggouari (Abyssinia, *Oliver*); Dugr (Hadramaut, *Lunt*); Kunde Miju, or Sokko (E. Africa, *Engler*); Feijão, macundi (Angola, *Welwitsch*); Adowa (W. Africa, *Christy*); Chowlee (India, *Watt*); Tow-Cok (China, *Watt*); Mun (Ceylon, *Capper*); Shadday (Madras, Mus. Kew); Kallai (Sikkim, *Hooker*); Lobiya (Saharunpore, *Duthie*); Sitao (Philippines, *Safford*); Paiyin (Burma, *Smetham*); Shiro Sasage (Japan, *Veitch*).—Cow Pea; Catiang or Catyang Bean; Cuba Bean (*Duthie*, Mus. Kew); Rice Bean (Hungary, *Berkeley*, Mus. Kew); Manchurian Beans (*Burgett & Newsam*, Mus. Kew); Asparagus Bean.

Lagos; Onitsha; Nupe; throughout the Tropics and in subtropical countries, or in countries with long hot summers.

Both the green pod and ripe seeds are used as food and the plants as fodder and as green manure. Cultivated for food at Onitsha (Barter, Herb. Kew); as a vegetable in the Hadramaut (Lunt, Herb. Kew); in Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 192), and as a vegetable in Guam (Safford, Pl. Guam, p. 396).

A form with long pods is raised in India by market-gardeners and sold as a substitute for French Beans (Watt, Comm. Prod. India, p. 1107). The young pods of "Dolique Mongette" are eaten in France and Italy in the same way as those of the French Bean (*Phaseolus vulgaris*) (Vilmorin Andrieux, Pl. Potagères, p. 342).

The Cow Pea is one of the standard forage plants of the Southern United States where it is extensively cultivated as an annual summer crop for hay, pasture and green manure (Lyon & Hitchcock, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 59, 1904, p. 47).

When grown for green manure it is recommended to turn pigs into the field about the time the first peas are ripening. An acre of ripening cow-peas will pasture from 15 to 20 pigs for several weeks (Queensland Agric. Journ. vi. 1900, p. 269).

The long peduncles yield a valuable fibre, used in Nupe for making ropes, nets and cloth (Barter, No. 923, Herb. Kew).

The cow-pea requires a hot climate, a moderate rainfall, and fairly rich soil. It is suggested that on rich land the cow-pea grows too rank for seed production and should be employed as a forage crop (Wiancko & Cromer, Purdue Univ. Agric. Exp. St. Bull. No. 139, 1910, p. 121)

The seed may be sown broadcast or in rows about 3 ft. apart. The crop matures in from 3 to 5 months. The habit of some of the intertwining varieties make them somewhat difficult to harvest. Efforts are being made by the U.S. Department of Agriculture to raise an upright or bush form as well as disease resisting, early fruiting, and with an abundance of seed (Year Book, U.S. Dept. Agric. 1907, p. 147).

There are many varieties under cultivation, differing in size and colour of the seed, and in the habit of growth. The white-seeded kinds are generally considered the best. "Red Quick Increase," "White Quick Increase," "Black Eye," and "Canadian" are all low-growing very prolific sorts, and are largely grown in peach orchards in Canada (Ann. Rep. Pub. Gdns. & Plantations, Jamaica 1904, p. 11), The following yields (average for 4 years) per acre have been obtained in Indiana: "Whippoorwill," 3547 lbs. of hay, and 12·2 bushels of grain; "Michigan Favorite," 3585 lbs. of hay, 13·5 bus. of grain; "Early Blackeye," 3252 lbs. hay, 12·1 bus. grain; "New Era," 3719 lbs. hay, 12 bus. grain; "Iron," 3810 lbs. hay, 7·2 bus. grain; "Clay," 3779 lbs. hay and 4·1 bus. grain (Wiancko & Cromer, Purdue Univ. Agric. Exp. St. Indiana Bull. No. 139, 1910, p. 121).

The "Little Iron Cow Pea," out of 75 varieties of Cow pea tested in South Carolina, is the only one found immune to the attack of worms (Queensland Agric. Journ. x. 1902, p. 83).

Experiments with Cow Peas at Onitsha have given some good results (Thompson, Col. Rep. Misc. No. 51, 1908, p. 43).

Ref.—"Catiang-Beans, *Vigna Catiang*," in Food Grains, India, Church, p. 156, with analysis.——"The Cultivation and Uses of the Catiang Bean or Cow Pea," Turner in Agric. Gaz. N. S. Wales, iii. 1892, pp. 858-861: Situation, Land, Sowing, Cultivation, Harvesting, Yield and Uses.——"*Vigna Catjang*," Dict. Econ. Prod. India, vi. pt. 4, 1893, pp. 236–238.——"The Cow Pea," Tardent, in Queensland Agric. Journ. i. 1897, pp. 208–211.——"Cow Peas," Smith, in Year Book, U.S. Dept. Agric. (for 1896), pp. 287-296: Origin, Forage, Cultivation, Harvesting, Ensilage, Feeding Value, Fertilizers (Govt. Printing Office, Washington, 1897).——"Cow pea, The Coming Crop for Central Queensland," Adams, in Queensland Agric. Journ. iii. 1898, pp. 92–98. ——"Curing Cow Pea Hay," l. c. v. 1899, p. 343.——Cow Peas, Smith, U.S. Dept. Agric. Farmers' Bull. No. 89, 1899, pp. 1–16.—— Cow Peas and Corn for Silage and Fodder, Gethys, U.S. Dept. Agric. Circ. No. 24. 1900, pp. 1–10.——"Cultivation of Cow Peas," Wicken, in Journ. Dept. Agric. W. Australia, iv. 1901, pp. 240–245.——"Cow Pea (*Dolichos sinensis* or *Vigna sinensis*), Dodson, Louisiana Agric. Exp. St. Bull. No. 72, 1902, pp. 24–39.——"Iron Cow pea" (a variety resistant to Wilt and Root-Knot), Orton, U.S, Dept. Agric. Bureau Pl. Ind. Bull. No. 25, 1903, pp. 65–68.——"Cow Pea Seed," in U.S. Dept. Agric. Farmers' Bull. No. 225, 1905, pp. 11–12: Harvesting and treatment under storage with carbon-bi-sulphide.——"Cow Pea," in 2nd Ann. Rep. Dept. Agric. Orange River Colony, 1905–06, pp. 274–276.——"Cow pea, *Vigna unguiculata*," Duggar, in Cycl. American Agric. Bailey, ii. pp. 260–267: Culture, Harvesting, Uses and Literature (Macmillan & Co., Ltd., London, 1907).——"The History of the Cow pea and its introduction into America," Wight, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 102, pt. 6, 1907, pp. 1–21; Abstract in The Agric. News, Barbados viii. 1909, p. 213.——"The Cow Pea," in Queensland Agric. Journ. xviii. 1907, pp. 107–110.—— "*Vigna Catjang*," in Comm. Prod. India, Watt, pp. 1107–1108.—— Cow Peas, Nielson, U.S. Dept. Agric. Farmers' Bull. No. 318, 1908, pp. 1–28.——"Developing New Varieties of Cow pea," Year Book, U.S. Dept. Agric. 1907, pp. 147–148; Abstract in The Agric. News, Barbados, viii. 1909, p. 219.

Vigna luteola, *Benth.*; Fl. Trop. Afr. II. p. 205.

Ill.—Jacq. Hort. Vindob. t. 90 (*Dolichos luteolus*); Mart. Fl. Bras. xv. pt. 1, t. 50, f. 2.

Vernac. name.—Dakudu (Lagos, *Thompson*).

Lagos: Old Calabar; Nupe.

Vigna nilotica, *Hook. f.*; Fl. Trop. Afr. II. p. 204.

Vernac. name.—Koondeh (Karagué, Cent. Africa, *Grant*).

The Natives (2° N. lat. Trop. Africa) dry the leaves like tobacco leaf, and eat them as a vegetable (Grant, Trans. Linn. Soc. xxix. p. 60).

Known principally under cultivation but very doubtfully distinct from *V. luteola* (Fl. Trop. Afr. l. c.).

Vigna triloba, *Walp.*; Fl. Trop. Afr. II. p. 204.

Katagum; Mozambique; The Cape and other parts of Africa.

Common cultivated bean of the fields, Katagum (Dalziel. Herb. Kew).

Found at an altitude of 2000 to 3000 ft. between Mpata and commencement of Tanganyika Plateau (Whyte, Herb. Kew).

VOANDZEIA, Thouars.

Voandzeia Poissoni, *A. Chev.* Comptes Rendus, cli. 1910, p. 85.

Tap root with slender rootlets sometimes tubercled. Main stem from 2–3½ in. long, procumbent, with numerous short slender stolons, spreading on the soil or partly buried in it, with short internodes and leaves mostly reduced to stipules. Petioles 2½–4½ in. long, slender, firm, vertical, swollen at the base, pubescent, channelled. Leaflets petiolate, membranous, more or less rounded at both ends, apex often apiculate, 3-nerved, glabrous, or with finely ciliate margin when young; terminal leaflet 2⅖–3 in. long, 1½–2 in. broad; petiolule pubescent, bearing two small linear stipels; lateral leaflets 1½–2⅜ in. broad, petiolules with only a single stipel; stipules oval-oblong entire from 2 to 3 lin. long, pubescent adpressed. Flowers single or paired. Calyx tube short, lobes linear-filiform nearly equal in length to the corolla. Corolla oblong, 4–5 lin. long, 1½–2 lin. broad, greenish-white, the apex of the standard violet-blue. Fruits buried, borne on slender stems ¾ in.–1 in. long, discoid or oblong-falciform, ½–¾ in. long, ¼–½ in. broad, valves slender, coriaceous, wrinkled on the outside, containing one or two seeds 3–3½ lin. long, 2½ lin. in diameter, pods one or two seeded.

There are several varieties characterized by the colour of the seeds, more often white, sometimes black, red or mottled (Chevalier, l.c.).

The "Bambarra Ground Nut" (*Voandzeia subterranea*) differs from this species chiefly in having yellow flowers, nearly spherical pods, usually containing a single seed, about ½ in. long and ⅜ in. broad.

Vernac. names.—Nadou, Sui, Doï or Dohi (Dahomey, *Chevalier*).

Dahomey; Yoruba.

The beans are used like those of Haricot. In Dahomey the chiefs or heads of families only eat this bean, and it is forbidden to the women of the country. Chevalier recommends its cultivation as a food for Europeans in all the French West African Colonies.

The seeds are sown in sandy soil towards the middle of the rainy season (May and June) and the crop is harvested 4 or 5 months later. The plant is only known under cultivation, but it reproduces itself for some years in fields where it has once been sown.

Ref.—"Sur une nouvelle Légumineuse à fruits souterrains cultiveè dans le Moyen-Dahomey (*Voandzeia Poissoni*)," Chevalier, in Comptes Rendus, cli. 1910, pp. 84–86.

Voandzeia subterranea, *Thouars*; Fl. Trop. Afr. II. p. 207.

Ill.—Engl. & Pranfl, Pflan. iii. pt. 3, f. 135; Tropenfl. 1899, p. 169; Engl. Pflan. Ost Afr. t. 22.

Vernac. names.—Epa orubu (Lagos, *Dawodu*); Pararu (Nupe, *Elliott, Dudgeon*); Kawaruru (Kontagora, *Dalziel*); Mgangala (Bornu, *Burkill*); Gujia, Debbi (Yola, *Dalziel*); Viélo or Jinguba de Cambambe (Pungo Andongo, *Welwitsch*; Angola, *Burkill*); Litlo (Shire Valley, Kérk); Senterinko or Manterin (Mombasa, Uganda, *Leicester Byrne*); Mpande or Mpandi (Unyoro, *Engler*); Ndzugu (Zanzibar, *Wakefield*); Njama (B. C Africa, *McClounie*); Inhlubu (Natal, *Burkill*) [Ahkwehu (Accra), Ekpa-ro-ro (Nargo, Gold Coast), Gub-a-Gubs (Gold Coast) *Easmon*]; Vouandzou (Belgian Congo, *De Wildeman*); Mjugu mawa (Mozambique, *Grant, Burkill*); Tindlohu (Transvaal, *Burkill*); Voandzobory ou Voandz ou (*Ammann*); Katjang bogor (Java, *Greshoff*).—Bambarra Ground Nut; Angolan Mandubi (Brazil).

Throughout Tropical Africa.

Used as food. An analysis of samples of seed from N. Nigeria shows a high percentage of moisture and low percentage of albuminoids, the seeds accordingly would not be of very high commercial value as a feeding-stuff for cattle, and would not in any way compare with beans, peas or lentils (Dunstan, N. Nigeria Gaz. Dec. 31st, 1908, p. 242). The details of the analysis are as follows: moisture 13·1, ash 2·4, fat 6·2, fibre 3·9, albuminoids 16·0 (total nitrogen 6·25), starch and other carbohydrates (by difference) 58·4, nutrient value 88·5, nutrient ratio 1 : 4·5.

For Cultivation see *Arachis hypogaea* and *Voandzeia Poissoni.*

Ref.—"*Voandzeia subterranea*, Erderbse, Angola - Erbse," in Pflanzenwelt Ost. Afr. Engler, Part B, pp. 122–123 (Dietrich Reimer, Berlin 1895). "Afrikanische Erderbse *Voandzeia subterranea*," in Der Tropenpflanzer, iii. 1899, pp. 169–170.——"*Voandzeia subterranea* ou Vouandzou," in Pl. Util. Congo, De Wildeman, Art. xxix. 1905, pp. 482–485.——"Le Voandzobory ou Voandzou (*Voandzeia subterranea*)," Ammann, in L'Agric. prat. pays chauds vii. 1, 1907, pp. 38–43.——"The Bambarra Ground Nut (*Voandzeia subterranea*)," Burtt-Davy, in Transv. Agric. Journ. v. 1907, pp. 453–456.——"Bambarra Ground - Nut (*Voandzeia subterranea*)," Burkill, in Kew Bulletin 1906, pp. 68–70, with analyses of the beans.——*Ibid.* l.c. p. 192, analysis of beans from Java.——"Report on Paruru Seeds or Bambarra Ground Nuts from N. Nigeria," Dunstan, in N. Nigeria Gaz. Dec. 31st 1908, pp. 241–242.——"The Bambarra Ground Nut," in Agric. News, Barbados, ix. 1910, pp. 340–341.

PACHYRHIZUS, Rich.

Pachyrhizus angulatus, *Rich.*; Fl. Trop. Afr. II. p. 208.

Ill.—Rumpf, Amb. v. t. 132, f. 1; Ralph, Ic. Carp. t. 30, f. 12 Mart. Fl. Bras. xv. pt. 1, t. 53; Hook. Ic. Pl. t. 1842; Kew Bull 1889, p. 121; Bull. Econ. Indo-Chine, 1905, p. 1116 (fl. & fr. branch), p. 1117 (tuber).

Vernac. names.—Yaka, or Wyaka (Fiji, *Seemann, Moloney*).—Short-podded Yam Bean.

Nupe. Cultivated throughout the Tropics.

Tuberous root edible. A starch is made from the tubers, or they are eaten when young (Kew Bull. 1895, p. 47); used as food either raw or cooked (Don, Hist. Dich. Pl. ii. p. 361); used for food in times of scarcity in Samoa (Powell, Herb. Kew). The young pods cannot be used as a vegetable as they are hairy and cause irritation (Kew Bull. l.c.). The root is used to cure fever and hæmorrhage in

Formosa (Watters, Mus. Kew). The tough fibre obtained from the stems is used for making fishing nets in Fiji (Don, l.c.): branches and stems used for making ropes in Fiji (Seemann, Herb. Kew).

Ref.—"Short-podded Yam Bean (*Pachyrhizus angulatus*)," in Kew Bull. 1889, p. 121.——"*Pachyrhizus bulbosus* (P. *angulatus*) Yambohne," in Pflanzenwelt Ost. Afr. Engler, Part B. p. 123.

Pachyrhizus tuberosus, *Spreng.* Syst. iv. Cur. Post. p. 281.

Roots tuberous. Stem herbaceous, twining, 10–20 ft. long. Leaves pinnate, 3-foliolate, long-petioled; stipules linear-lanceolate; leaflets broadly rhomboid-ovate, pointed, entire or obscurely sinuate, in young specimens sometimes shallowly lobed, terminal leaflet broadly cuneate at the base, lateral leaflets oblique, stipels subulate. Racemes sub-compound, lower branches very short, with flowers in fascicles. Calyx 5-lobed, lobes as long as the tube, superior shorter. Corolla white. Legume 8–12 in. long, 9–10 lin. broad, slightly hairy, compressed when young, somewhat bent, with deep transverse depressions between the red, black, or pale spotted seeds.

Ill.—Plumier, Ic. Burm. t. 220 (*Dolichos foliis integerrimis*); Hook. Ic. Pl. t. 1843; Kew Bull. 1889, p. 62.

Yam Bean: Starch Bean.

Commonly cultivated in the Tropics and warm countries.

The tuberous roots are eaten as food and a starch is obtained from them. An analysis made in Jamaica shows that the root contains: moisture 69·43 per cent., solids 30·57, starch 17·73, sugars 2·86, Nitrogen 0·42; regarded as inferior to the sweet potato in feeding value (Ann. Report, Pub. Gdns. & Plantations, Jamaica, 1907, p. 10).

Both the tubers and beans contain a poisonous resin, the latter yielding over 2 per cent. The resin is a very active fish poison. The beans have a high value as foodstuffs and resemble the Soy Bean (*Glycine Soja*) in composition (Kew Bull. 1895, p. 48).

No cyanogenetic glucosides have been found in the seeds (Bull. Imp. Inst. i. 1903, p. 17).

Grown from seed about 2 ft. apart in rows about 3 ft. apart; otherwise the cultivation is the same as for yams (*Dioscorea sativa*) planted on mounds and trained on poles. The plants come to maturity in about 9 or 10 months.

The yield in Montserrat has been at the rate of 27,780 lbs. of tubers per acre (Report Bot. St. Montserrat, 1906–07 p. 13); in Dominica 8·6 tons (blue-flowered native) and 7·6 tons (white-flowered Porto Rico) was obtained (Report Bot. St. Dominica, 1905–06, p. 22). Up to 5¼ lbs. is given as the weight of one tuber (Report Bot. St. St. Kitts-Nevis, 1905–06, p. 17).

Ref.—"Yam Bean" in Kew Bull. 1889, pp. 62–63.——*Ibid.* 1895, pp. 47–48, with analyses of tubers and seed.

PSOPHOCARPUS, Neck.

Psophocarpus longepedunculatus, *Hassk.*; Fl. Trop. Afr. II. p. 208.

Ill.—Mart. Fl. Bras. xv. pt. 1, t. 52; Endlicher, Atakta Botanica i. tt. 1, 2 (*Diesingia scandens*); Engl. & Prantl, Pflan. iii. pt. 3, f. 133 D-E; Engl. Pflan. Ost. Afr. t. 24, ff. O-Q (pod and seed).

Old Calabar; Nupe; Kontagora. Cultivated throughout the Tropics.

Tuberous root, may be eaten like that of *Pachyrhizus*. The young pods can be used as a vegetable (Engler, Pflan. Ost Afr. Part B, p. 124).

Found twining on shrubs by streams, Kontagora (Dalziel, Herb. Kew); at an altitude of 1350 feet, at Mbwiga (lat. 7° 24′ S.) (Grant, Trans. Linn. Soc. xxix. p. 60).

Psophocarpus tetragonolobus, *DC.*; Fl. Trop. Afr. II. p. 209, is also widely cultivated in the Tropics, but there appears to be no record of its cultivation in Nigeria. It is known as the "Goa Bean," "Four winged bean," "Burma Haricot," &c. and the uses are the same as those of P. *longepedunculatus*.

Ref.—"*Psophocarpus tetragonolobus*, Goa Bean," Burkill, in Agric. Ledger No. 4, 1906, pp. 51-64.——"Note sur le Haricot de Birmanie," Dautremer, in L'Agric. prat. d. pays chauds, vii. 2, 1907, pp. 429–432.

DOLICHOS, Linn.

Dolichos biflorus, *Linn.*; Fl. Trop. Afr. II. p. 210.

Ill.—Church, Food Grains, India, tt. 32, 33; Agric. Gaz. N.S. Wales ii. 1891, t. 44; Duthie, Field Crops, t. 81.

Vernac. names.—Kulti or Kúlthí (India, *Church*, *Smetham*, *Watt*) Kultáhi-Máh (Assam, *Basu*).—Horse Gram.

Nupe: Katagum; Kontagora; extending through Tropical Africa to Loanda, Mozambique, Zambesiland, &c.; India, Ceylon, Burma.

An important food, fodder, and green manure. The long continued use of the beans as food is regarded as injurious: they are reputed in some districts to cause œdematous swellings (Church, Food Grains, India, p. 162). Kulthi flour is used in preparing a kind of native sweetmeat, esteemed as a diet for women after confinement; it is considered wholesome and light of digestion (Basu, Agric. Ledger, No. 5, 1903, p. 135).

Grown from seed (about 10 lbs. to the acre), the crop comes to maturity in from 3 to 5 months. For fodder purposes the plants could be cut green after about a month or two, or the haulms used after the seeds are harvested. The cultivation in general is easy and can be carried on at almost any season with a light rainfall. A good crop would amount to 6 maunds [493 lbs.] of pulse, and 2000 to 4000 lbs. and upwards of fodder per acre (Watt, Comm. Prod. India, pp. 504, 505).

Found creeping over stones in rocky places, Nupe (Barter, Herb. Kew); wild in the Himalaya to Ceylon and Burma ascending to 3000 ft. in Sikkim (Fl. Br. India, ii. p. 210). Large areas are cultivated in India, where in Bombay (1905–06) alone 545,738 acres were under the cultivation of this gram (Watt, l.c. p. 508).

Ref.—"Horse Gram, *Dolichos biflorus*," in Food Grains of India, Church, p. 162, with analysis.——"*Dolichos biflorus*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 175–183.——"The Cultivation of the Horse Gram," Turner, in Agric. Gaz. N. S. Wales, ii. Aug. 1891, pp. 444–445.——"Kultáhi-Máh, *Dolichos biflorus*, Basu, in The Agric. Ledger, No. 5, 1903, p. 135.——"*Dolichos biflorus*, Horse Gram" in Comm. Prod. India, Watt, pp. 503–508.

Dolichos Lablab, *Linn.*; Fl. Trop. Afr. II. p. 210.

Ill.—Jacq. Hort. Bot. Vindob. t. 124 (*D. benghalensis*); Schk. Handb. t. 199^b; Gaertner, Fruct. Sem. Pl. ii. t. 150; Lam. Encycl, t. 610; Bot. Mag. t. 380 (*D. lignosus*); Bot. Mag. t. 896; Smith.

Exotic Bot. t. 74 (*D. purpureus*) ; Bot. Reg. (1824), t. 830 (*D. purpureus*) ; Geel, Sert. Bot. v. ; Wight, Ic. Pl. Ind. Or. i. t. 57 (*Lablab vulgaris*) ; Ralph, Ic. Carp. t. 30, f. 14 (*Lablab vulgaris*) ; Mart. Fl. Bras. xv. pt. 1, t. 51, f. 2 ; Duthie, Field Crops, t. 34a and 34b (var. *purpureus*) ; Church, Food Grains, India, t. 31 ; Engl. & Prantl, Pflan. iii. pt. 3, f. 136 A–G ; Engl. Pflan. Ost Afr. t. 24, ff. K–N (pod and seed) ; Queensland Agric. Journ. iii. 1898, p. 260 (var. *purpureus*) ; Vilmorin Andrieux, Pl. Potagères, p. 345 ; Rev. Hort. Belge, 1908, p. 326.

Vernac. names.—Kodageiya (Katagum, *Dalziel*) ; Majombo (Usambara, *Engler*) ; Lubiah (Arabic, *Engler*) ; Gueenguezo, Maharageh (Karagué and Unyoro, *Grant*) ; Pien Ton (China, *Bullock*) ; Buona Vista or Bonavist (Barbados, *Hughes*) ; Bonavist (B. Guiana, *Bailey*) ; Antaque (Mauritius).——Lablab Bean ; Poor Man's Bean, Tonga Bean (Benson in Queensland Agric. Journ. 1898, p. 260) ; Indian Butter Bean ; Hyacinth Bean.

Niger : Katagum ; throughout Tropical Africa, Asia and America.

Used as food—both the green pods and the ripe seed, like French Beans.

In Karagwé and Unyoro the leaves are dried and eaten as a vegetable ; the beans are also eaten but not considered good as they induce flatulency (Grant, Trans. Linn. Soc. xxix. 1872, p. 61).

Experiments with "Bonavista" Beans at Onitsha (1906) gave good results (Thompson, Col. Rep. Misc. No. 51, 1908, p. 43).

In India Lablab is not a regular agricultural crop ; it is more of a garden plant, being trained to form arbours over the doorways of village huts and allowed to climb on trees or hedges.

The quantity of seed to sow an acre is given at 5 to 8 lb., and the yield about 250 lb. to 400 lb. per acre. Other estimates are 45 seers [90 lb.] of pods from a plant in a year, and on good soil and with careful cultivation 1300 lb. of pulse and an equal weight of useful fodder per acre (Watt, Comm. Prod. India, p. 509).

Some support is necessary and if the plant is grown as a field crop it is convenient to grow it with Castor Oil (*Ricinus communis*) or some similar crop.

Under cultivation there appear to be at least two well marked forms. In India two varieties are distinguished : *Lablab*,—seeds with long axis parallel to the sutures, and var. *lignosus*—seeds with long axis at right angles to the sutures (Prain, Journ. Asiatic Soc. Bengal, lxvi. p. 430) ; in the Central Provinces and Berar one with white, and the other with dark purple flowers (Watt, Comm. Prod. India, p. 509) ; also in China (Henry, Econ. Bot. China, p. 12) ; in the United States var. "Black Hyacinth"—seeds dark brown to nearly black, and "White Hyacinth"—seeds white (Irish, 12th Rep. Missouri Bot. Gdn. 1901, p. 145) ; one with flowers and seeds white, and one with flowers violet and seeds black (Vilmorin Andrieux, Pl. Potagères, p. 345).

Ref.—"*Dolichos Lablab*," in Field and Garden Crops N.W. Prov. and Oudh, Duthie & Fuller, ii. p. 23.——"The Lablab-Bean, *Dolichos Lablab*," in Food Grains, India, Church, p. 161 with analyses.——"*Dolichos Lablab*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 183–190.——"Dolique Lablab," in Pl. Potagères, Vilmorin Andrieux, pp. 345–346.——"*Dolichos Lablab*" in Comm. Prod. India, Watt, pp. 508–510.

CAJANUS, DC.

Cajanus indicus, *Spreng.*; Fl. Trop. Afr. II. p. 216.

Ill.—Hughes, Hist. Barbados, t. 19 (Pigeon Pea Tree); Plumier, Ic. Burm. t. 114, f. 2 (*Cytisus mollis*); Jacq. Hort. Bot. Vindob. ii. t. 119 (*Cytisus Pseudocajan*); Desc. Ant. iv. t. 280 (*Cytisus Cajan*); Tuss. Ant. iv. t. 32 (*Cytisus Cajan*); Bot. Reg. (1845) t. 31 (*C. bicolor*); Ralph, Ic. Carp. t. 30, f. 11; Rev. Hort. 1874, p. 191; Bot. Mag. t. 6440; Duthie, Field Crops, ii. tt. 33, 34 (var. *bicolor*); Church, Food Grains, India, tt. 34, 35; Engl. & Prantl, Pflan. iii. pt. 3, f. 133 J; Agric. Gaz. N. S. Wales, iii. 1892, t. 4; Queensland Agric. Journ. ii. 1898, t. 38 (habit as a field crop) t. 39 (enlarged from Bot. Mag. l.c.); Cook, U. S. Dept. Agric. Div. Bot. Bull. No. 25, 1901, t. 12; L'Agric. prat. pays chauds, v. pt. 2, 1905, p. 56; Bull. Econ. Indo-Chine, 1905, p. 1114.

Vernac. names.—Otili (Lagos, *Dawodu*); Otili (Yoruba, *Millson*); Wake-n-turawa or Wake-n-damfammi (Kontagora, *Dalziel*); Wake-n-turawa (Zaria, *Parsons*); Fiofio (Onitsha, *Young*); Akokola (Sierra Leone, *Scott Elliot*); Jinsonge or Quinsonge (Angola, *Welwitsch*); Ahti (Accra, *Easmon*); Mpindamuti (Uganda, *Dawe*); Nkolimbo (Banyoro, Uganda, *Dawe*); Baraz (Unyoro, *Grant*); Ambrevate or Ambrevade (Mauritius, Kew Bull. 1887, p. 8); Dhal (India, *Watt*); Rahar-Máh (India, *Basu*); [Kolokoto (Inonga, Lorenzo Marques); Ndote (M'Chopes, Zuvalla); Bœre (Echuaho, Quelimane, *Sim*]; [Lenteha fransesa (Guam), Cadios, Kadyos, Cadius, or Caguios (Philippines), Gandul (Porto Rico) *Safford*]; Chinchoncho (Venezuela, Mus. Kew).—Pigeon Pea; Congo Pea; Congo Bean; Angola Pea.

Used as food—the tender green pods like French Beans, the young green peas like the ordinary garden pea, and the ripe ones whole, split, or ground into meal. The young shoots, and the leaves stripped off at the time the peas are harvested make good fodder for cattle.

The outer integument of the seed with part of the adhering kernel is a favourite food for milch cows, and the pea or pea meal is largely used in India as a cattle medicine (Watt, Comm. Prod. India, p. 200).

The leaves are used in Yoruba as a cure for sore throat (Millson, Kew Bull. 1891, p. 217); In India for apthae and spongy gums, and for various medicinal purposes (Dict. Econ. Prod. India).

In French Guiana the starch obtained from the seeds is employed as a resolutive, the shoots, green pods and flowers as an infusion for pectoral affections, an application of the boiled leaves to heal wounds or sores; the juice of the leaves, expressed cold, to stop hemorrhage, and a decoction of the leaves to cleanse ulcers (Heckel, Pl. Med. et Toxiq. Guy. Franç. in Ann. Inst. Col. Marseille, 1897, p. 137). In India the stalks are used as fuel, the larger ones being prized for making gunpowder charcoal; the thin straight branches for roofing, basket work, the wattling of carts and the tubular wicker work lining of wells (Watt, l.c.). They are used in Kontagora for making fences &c. (Dalziel, Bull. Imp. Inst. 1907, p. 259).

In Northern Bengal and Assam the plant is specially grown as a food for the lac-insect (l.c.); in Madagascar for silkworms (Jumelle, Cult. Col. Aliment. pp. 128–131); and also in the Antilles (Tussac, Fl. Ant. iv. p. 96).

Sow broadcast or in rows 4 to 6 ft. apart. The plant is a perennial but is usually treated as an annual. It will stand a fair amount of drought, and begins to bear in about 6 months. Plants may reach a height of 8 ft. before flowering (Queensland Agric. Journ. ii. 1898, p. 473).

The Pigeon Pea has been grown in Kontagora, where it reaches a height of 8 or 9 ft.; the flowers appear in October (seeds sown early in the year), and an abundant crop of peas is borne in December and the following months (Dalziel, Bull. Imp. Inst. 1907, p. 259).

According to Dudgeon this pea has been introduced to N. Nigeria south of Zaria, and to a small extent into Zaria. He recommends it for growing on land to be fallowed in which situation it yields crops for 2 or 3 years without cultivation, preventing the growth of weeds, and enriching the soil (N. Nigeria Gaz. July 31st, 1909, p. 158). Sown closely and kept well clipped, makes admirable hedges in Zaria (Parsons, N. Nigeria Gaz. April 30th 1910, p. 97).

Experiments at Onitsha have met with good results (Thompson, Col. Rep. Misc. No. 51, 1908, p. 43).

A sample of beans from N. Nigeria, examined at the Imperial Institute, shewed the following characters: moisture 11·72 per cent.; crude proteins 18·40; fat 1·42; starch &c. 57·12; fibre 8·06; and ash 3·28 per cent. Commercially the beans were considered satisfactory and suitable for use as a feeding stuff, worth in this country about £6 5*s* per ton (N. Nigeria Gaz. Jan. 31st 1910, p. 3).

Almost universally cultivated on red grit or laterite &c. from sea level to an altitude of about 2000 feet in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 42).

Ref.—"*Cajanus indicus*," in Field & Garden Crops, Duthie & Fuller, ii., pp. 20–22.——"The Pigeon Pea," in Food Grains of India, Church, pp. 169–170.——"*Cajanus indicus*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 12–15.——"The Cultivation of the Pigeon Pea or Catjang" Agric. Gaz. N. S. Wales, iii. 1892, pp. 6–8. ——"*Cajanus indicus*" in Les Cult. Coloniale, Pl. Alim. Jumelle, pp. 128–131 (J. B. Baillière et Fils, Paris, 1901).——"*Cajanus indicus*," in Comm. Prod. India, Watt, pp. 196–200.

RHYNCHOSIA, Lour.

Rhynchosia minima, *DC.*; Fl. Trop. Afr. II. p. 219.

Ill.—Cambessides, Pl. Rar. Jacquemont t. 54 (*R. laxiflora*); Mart. Fl. Bras. xv. pt. 1, t. 54, f. 2.

Katagum; Lokoja; Nupe; Kontagora; widely distributed in the Tropics.

A twiner found in the bush after burning, Kontagora; Katagum (Dalziel, Herb. Kew); ascending in the Himalaya to 3000 ft. where it is eaten by cattle (Dict. Econ. Prod. India).

DALBERGIA, Linn.

Dalbergia melanoxylon, *Guill. et Perr.*; Fl. Trop. Afr. II. p. 233.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 53; Ralph, Ic. Carp. t. 26, f. 8; Tropenpfl. 1901, p. 26 (habit); Ann. Bot. Gard. Calcutta, x. 1904, t. 22; Stone. Timb. Comm. t. 5, f. 37 (trans. sec. of wood.)

Vernac. names.—Makarufo (?) (Hausa, *Dalziel*); M'Pingo, Mgembeh, M'teendeea (Madi, *Grant*); M'Pingo (B. E. Africa, *Hutchins*); Pingo (Shiramba, Zambesi, *Kirk*); Mumpingue (Angola, *De Wildeman*); Dialambam (Senegal, *Moloney*; Sierra Leone, *Scott Elliot*); Grenadilha (Port E. Africa, *Sim*); Mufonju (Lunyoro, Uganda, *Dawe*); Motanga (Luganda, Uganda, *Dawe*); Babanus, Ebenus (Arabic, *Muriel* [Blue Nile, near Sa-o-leil]; Tari

(Hameg, *Muriel* [l.c.]) ; [Ghelambann (Ouloff) ; Koffé (Toucouleur) ; Koffo (Malinke, Bambarra, Kassonké) ; Irifin Ouassalou), *Chevalier*].

African Blackwood. Sometimes known as West African Blackwood, China Blackwood, Cape Damson, Ebony Tree, Ebony Wood, Ebony, Mozambique Ebony, Unyoro Ebony, Senaar Ebony, Ébène du Sénégal, African Grendilla-wood, Sierra Leone Ebony, Senegal Ebony, Congo-holz.

Yola ; Katagum : and throughout Tropical Africa from Senegal to Angola on the west, extending through the Soudan, Uganda and the Zambesi region to Mozambique on the east. Cultivated in India.

A very valuable wood, recommended as a substitute for Ebony proper (*Diospyros* spp.), suitable for furniture work, musical instruments, turnery &c.

Used for the tips of the Natives' arrows and the wooden hammers used in the manufacture of bark cloths in Madi (Grant, Trans. Linn. Soc. xxix. 1872, p. 62) ; for rafters (Moloney, For. W. Afr. p. 323), for roofing most of the principal houses in Omdurman (Kew Bull. 1899, p. 198), for tent mallets and walking sticks (Hutchins, Report, Forests B. E. Afr. 1909, p. 5).

It is very hard and heavy—weighs 78½ lbs. per cubic foot (Bull. Imp. Inst. 1908, p. 239) ; 74½ lbs. per cubic foot (Stone, Timb. Comm. p. 61). A specimen in the Museum at Kew has a specific gravity of 1·177 = 73·5 lbs. per cubic foot.

Small logs 2½ to 4 ft. in length, 4 to 9 in. in diameter have been imported into Liverpool (Messrs. Jos. Gardner & Sons 1908) described as "very defective and of irregular shape particularly favoured by amateur turners" (Hillier, Kew Bull. 1908, p. 185). Logs 3 ft. or more in length, and about 8 to 16 in. in diameter are recommended for export, and would be worth about £6 to £7 per ton in London (Bull. Imp. Inst. 1909, p. 269).

The wood is said to be insect-proof, but a sample from Uganda in the Kew Museum shews the borings of some insect.

The root is used as a cure for toothache in Madi (Grant, Trans. Linn. Soc. l.c.) ; as an ingredient in a local preparation of arrow poison ; added to "bammi" or "palm wine," and medicinally in Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 257, *Dalbergia* sp.).*

May be raised from seed, said to grow freely in all soils ; found in Uganda as a prickly bush or small tree, rarely of any useful size (Dawe, Rep. Bot. Mission, Uganda, 1906, p. 29) ; with a maximum diameter of 9 ins., south of Karkanj, on the Blue Nile, and on the Sobat River (Kew Bull. 1899, p. 198) ; very abundant, though rarely exceeding a height of 20–25 ft. in Kontagora, and in Lokoja (Dalziel, Bull. Imp. Inst. 1907, p. 257, *Dalbergia* sp. : presumably this species, but there is no specimen at the Kew Herbarium to support this view)* ; widespread throughout the coast scrubs (up to about 1200 ft.) of B. E. Africa, usually as small trees with crooked stems up to 2 ft. in diameter, but probably too scarce and crooked to export with profit, and too slow growing to be profitable in forest plantations (Hutchins, Report, Forests B. E. Afr. 1909, p. 5) ; as a climbing shrub, wild or often planted in the Konkan and N. Kanara, India (Gamble Man. Ind. Timb. p. 247).

Ref.—"African Blackwood, *Dalbergia melanoxylon*," in Timbers of Commerce, Stone, pp. 61-62——"*Dalbergia melanoxylon*," in

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* This may apply more correctly to *Ormosia laxiflora* ; see p. 248.

Les Veg. Utiles de L'Afrique Trop. Franç. fasc. iii. "Recherches sur les bois de différentes espéces de Légumineuses Africains," Chevalier, Perrot et Gérard, pp. 88–90——"Ebony from the East Africa Protectorate," in Bull. Imp. Inst. vii. 1909, pp. 269–270.

PTEROCARPUS, Linn.

Pterocarpus erinaceus, *Poir.*; Fl. Trop. Afr. II. p. 239.

Ill.—Lam. Encycl. t. 602, f. 4; Gray, Western Africa, t. D (*P. africanus*); Guillem, Perr. Rich. Fl. Senegamb. t. 54; Woodville, Med. Bot. v. t. 12; Ralph, Ic. Carp. t. 28, f. 9 (*Echinodiscus erinaceus*); Vidal, Fl. For. Filip. t. 40 B; Engl. & Prantl, Pflan. iii. pt. 3, f. 126 J (Pod ½ size); Ann. Inst. Col. Marseille, 1902, p. 97, f. 5 (tree in French Soudan); Sim. For. Fl. and For. Res. Port. E. Afr. t. 59.

Vernac. names.—Apepe (Oloke-Meji, *Punch*) Apepe or Ara (S. Nigeria, *Foster*); Ado Isehin (Lagos, *Rowland*); Magiji (Hausa, *Dudgeon*); Zanchi (Zungeru, *Elliott*); Kaino (Mandingo, *Dudgeon*); Ngillasonde or Mutete (Pungo Andongo, *Welwitsch*); Mirahondi or Munhaneca (Huilla, *Welwitsch*); Ibel (Pahoin, *De Wildeman*); Onigo (Gaboon, *De Wildeman*); N'Goula (Gaboon, *Chevalier*); Kari (W. Africa, *Gray*); [Thondo (Ironga, Lorenço Marques); Imbilo (Echuabo, Quelimane); Moqombire-bire (Swahili); Shuiaan (Swazi), *Sim*].——African Rosewood; West African Rosewood; Senegal Rosewood; Gambian Rosewood; Santal Rouge d'Afrique; African Kino; Gambian Kino.

Lagos; Oloke-Meji; Nupe; Zaria, Zungeru; Bassa; Borgu and widely distributed in Tropical Africa.

The wood is very valuable, used in cabinet work, and turnery (De Wildeman, Pl. Util. Congo, Art. xxvi. (1904) pp. 371, 378; Moloney, For. W. Afr. p. 324; Spon's Encycl. p. 1668; Cat. Prod. Col. Franç. Exp. Univ. 1867, p. 44), by the natives in Angola for making war clubs (Hiern. Cat. Welw. Afr. Pl. i. p. 280); on the East Coast of Africa for paddles, oars, &c.; also suitable for naval construction, planking, &c. (Moloney, l.c.); well adapted to various domestic uses, agricultural implements, &c. (Hiern, l.c.), and suitable for every local purpose (Sim, For. Fl. & For. Res. Port. E. Afr. p. 118).

It is very durable, hard and fine-grained, dark red in colour; weighs 50 to 55 lbs. per cubic foot (Sim, l.c.). A specimen in the Kew Museum has a specific gravity of 0·9181 = 57 lbs. per cubic foot. Sim (l.c.) states that the wood is ant-proof, not liable to warp or crack.

A "Gum Kino" is obtained from this tree, obtained by making incisions in the wood; the juice at first is of a very pale red colour and very liquid, but it soon coagulates, turning to a deep blood-red colour (Gray, West. Africa, p. 396, *P. africanus*). In Angola the resin is called "Sangue do Drago" (Hiern. Cat. Welw. Afr. Pl. i. p. 280); and is imported into Portugal under this name (Heckel, Ann. Inst. Col. Marseille, vi. 1899, p. 85), also into England in small quantities for medicinal purposes—used as an astringent. African Kino is the same in solubility and chemical characters as that of Indian Kino (*P. Marsupium*) (Flückiger & Hanbury, Pharmacog. p. 198), officially recognized in the British Pharmacopoeia.

The kino is used by the natives of Angola in the treatment of wounds (Hiern, l.c.); as an astringent medicine, and for various medicinal purposes (Moloney, l.c.) (Heckel, l.c.); it is one of the few important products of Bassa (Col. Rep. Ann. No. 516, 1907 (for 1905–06) p. 84).

The tree yields a red dye ; it is described as one of the sources of Camwood dye in Zaria (Dudgeon, N. Nigeria, Gaz. July 31st, 1909, p. 160) ; as the Camwood of the interior (Barter, Herb. Kew), and as giving from the seasoned pounded wood a darker red dye than the "Osun," though not so good. The colouring matter is obtained from the heartwood principally, but the bark and roots yield it also, and some trees when cut yield little or no dye (Barter, Herb. Kew).

Propagated by seeds. According to Gray (Western Africa, p. 395) the seeds ripen in about 5 months after the tree begins to flower. The natural regeneration is good (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89) ; occurs in the dry open forests of S. Nigeria (Thompson, l.c. No. 51, 1908, p. 62) ; in fair quantity in the Ndiana, Akpayafe and Akwa Rivers District, S. Nigeria (Billington, Report on the Botany [of this region], 1895, p. 27) ; in open and wooded country, Zungeru (Dalziel, Herb. Kew), where it grows to a height of 50 to 60 ft., flowering before the leaves appear, in December and January (Elliott, Herb. Kew) ; attaining a maximum height of about 30 feet, and deciduous during half the dry season in Yoruba, Nupe, Borgu, and Zaria (Barter, Herb. Kew) ; very plentiful in sandy and rocky woods throughout Pungo Andongo, sometimes constituting the bulk of the forest (Hiern, Cat. Welw. Afr. Pl. i. p. 279) the trunk not usually exceeding 18 ins. in diameter (l.c .p. 280) ; confined to the open forests and never attaining a large size in the Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89) ; growing 40 or 50 ft. high, isolated on laterite plateaux, at an altitude of 3600 ft. in Sierra Leone (Scott Elliot, Herb. Kew) ; obtainable in quantity in the Maganja forest, Port. E. Africa (Sim, For. Fl. and For. Res. Port. E. Afr. p. 118).

Ref.—"Kino," in Pharmacographia, Flückiger & Hanbury, pp. 194–199.——"Kino de Gambie (*Pterocarpus erinaceus*), Vuillet, in L'Agric. prat. pays chauds i. 1901, p. 339.——"*Pterocarpus erinaceus*," in Les Vèg. Utiles de l'Afrique Trop. Franç. fasc. iii. Chevalier, Perrot et Gérard, pp. 120–124, illustrated with transverse sections of the wood highly magnified, and summarizing the information in a tabular statement at end of volume.

Pterocarpus esculentus, *Schum & Thonn.* ; Fl. Trop. Afr. II. p. 238.

Vernac. names.—Idogun (Lagos, *Rowland*) ; Akpanagia (Benin, *Dennett*) ; Gbingbin (Oloke-Meji, *Foster*) ; Gbingbindo (W. Prov. S. Nigeria, Letter Imp. Inst. to Kew, 28th July 1909) ; Batui (Sierra Leone, *Scott Elliot*) ; Atont, B'Atwi or Batwi (Sierra Leone, *Unwin*).

Lagos ; Old Calabar ; Attah ; extending in W. Africa from Senegambia to Fernando Po.

The seeds are edible, but when raw have an intoxicating effect, Nupe (Barter, Herb. Kew ; Mus. Kew ; Moloney, For. W. Afr. p. 324) ; Sierra Leone (Scott Elliot, Herb. Kew).

The wood is said to yield a dye similar, though inferior to that of *Pterocarpus erinaceus.*

Pterocarpus lucens, *Guill. & Perr.* ; Fl. Trop. Afr. II. p. 238.

Ill.—Rich. Tent. Fl. Abyss. t. 45 (*P. abyssinicus*).

Vernac. names.—Taraiya (Arabic, *Muriel*) ; Immirora (Hameg, *Muriel*).

Yola ; Senegambia, Abyssinia, &c.

Wood white or yellowish white, Blue Nile (Muriel, Herb. Kew) ; good timber, Sudan (Broun, Herb. Kew) ; valued for its excellent timber in Yola (Dalziel. Kew Bull. 1910, p. 137).

Exudes a red gum in very small quantity (Muriel l.c.).

A tree with habit of *P. erinaceus*, but pods narrower and nearly smooth; common in the Yola Province and in the forest south of Sa-o-leil village, Blue Nile.

Pterocarpus Osun, *Craib* in Kew Bull. 1910, p. 329.

A large tree, young parts brown tomentellous, branchlets aculeate. Leaves imparipinnate 8-12 in. long, petiole 1¾–2 in. long; leaflets 13–15, petioled, mostly oblong, acuminate at the apex, rounded or truncate at the base, up to 5½ in. long., 2 in. broad, pilulose on the under surface in a young state, glabrous when mature, coriaceous, lateral nerves about 10 pairs. Fruit pale brown, rotundate, 1¾ in. in diameter, wings 2 in. broad, chartaceous, pilulose and sparingly aculeate, umbo densely aculeate; stipe ½ in. long. Seeds solitary, oblong, ¾ in. long, testa brown, shining, smooth.

Vernac. names.—Ewe-Osun-Pupa (Ibadan, No. 1, S. N. iv. Imp. Inst. 8th June 1909, Herb. Kew); Osun or Irosun (Ibadan, *Punch*); Osun (S. Nigeria, *Dodd*); Osun (Yoruba, *Unwin*); Ume (Benin, *Thompson*, *Unwin*).—Red Camwood.

Ibadan (Punch, No. 114; Imp. Inst. No. 1, 1909, Herb. Kew): S. Nigeria (Dodd, No. 405, Herb. Kew); Mamu (Unwin, 1910, Herb. Kew); Ekom or Ikum, Cross River (Holland, No. 198, Herb. Kew).

The camwood of Lagos (Punch, Herb. Kew); one of the two kinds of camwood recognised among the Yorubas. They are known by the names of "Iro-usun-pupa," implying that the colour of the wood is red, and "Iro-usun-dudu," meaning black camwood.

The preparation for the local market is described as follows; "A large tree is felled and the stump which is left in the ground is killed by means of cutting through the lateral roots, which are laid bare in the first instance, the heart-wood of the stump is at this time a dark red, but the sap-wood is white; the dead stump is left in the ground to allow the white ants to destroy all the sap-wood, which they will do in a year or more. The remaining heart-wood is carefully collected and washed to remove all dirt, after which it is pounded in a mortar to a moderately fine powder, and sold in this form, to be subsequently ground between stones and mixed with water to form a paste or balls, in which state it is usually purchased for colouring the human skin" (Dudgeon, N. Nigeria Gaz. July 31st 1909, p. 161).

See also Barwood (*Pterocarpus Soyauxii*).

"Osun" when newly cut is said not to yield the required dye, and in order to develop the colour the trunk is allowed to lie in water for from 5 to 10 years. The wood of this tree (Ume) is similarly treated in the Central Province (Kew Bull. 1908, p. 192).

The dried heart-wood, bark and root are used at Fiditi (Ibadan) in the preparation of the dye for native purposes.

Red camwood "Osun Pupa" is said to occur at Grenya on the Guarara River. It has large lateral roots extending for some distance from the trunk along the surface of the ground; on these roots transverse cuts are made from which a blood-red liquid exudes, which dries after being carefully covered with leaves and earth, and in due time the bark with the dry red substance upon it is scraped off and pounded (Dudgeon, N. Nigeria Gaz. July 31st 1909, p. 161).

A Kino similar to that of *Pterocarpus erinaceus* is obtained from the bark.

The wood of "Ume" has realized as much as £10 per ton, but the export does not appear to have been continuous; the small billets for use as a dye-wood are sold in the Central Province of Southern Nigeria at *3d.* to *6d.* the basket load (Kew Bull. 1908, p. 192).

A specimen of the dye wood of "Osun Pupa" from Fiditi (Ibadan) in the Kew Museum has a specific gravity 0·7 = 43·75 lbs. per cubic foot.

The tree may be propagated by seeds, which ripen [in the neighbourhood of Ibadan] early in December (Punch, Herb. Kew). "Ume" is reported as common all over the Central Province, S. Nigeria where it grows chiefly on the lower-lying land, and attains a maximum girth of about 9 ft. (Kew Bull. l. c. p. 193).

Pterocarpus Soyauxii, *Taub.* in Hook. Ic. Pl. t. 2369.

A tree up to 100 ft. high, branchlets terete with the bark longitudinally ridged, in a young state, together with the petioles and axes of the inflorescences, rusty tomentellous. Leaves imparipinnate; common petiole 2½–6 in. long; leaflets alternate, 11–13, distinctly stalked, linear-oblong or sometimes almost obovate-oblong, slightly produced and a little emarginate at the apex, minutely mucronulate, obtuse or rounded at the base, 1¾–2½ in. long, 1–1¼ in. broad, glabrous on both surfaces, slightly shining above; midrib rusty-tomentellous below in the young leaves, at length nearly glabrous; lateral nerves subparallel, prominent; veins slightly prominent. Inflorescence a pyramidal panicle, 4–8 in. long, 3½–4¾ in. broad; branches spreading or slightly spreading, many-flowered; pedicels slender, ⅓ in. long; bracteoles ¼ in. long, tomentellous. Calyx-tube 2½ lin. long, tubulose-campanulate, shortly dentate, rusty tomentellous. Standard double the length of the calyx, rounded, narrowed to the base into a long claw, shortly dentate. Wings broadly obovate, with a long claw, about double the width of the keel-petals. Ovary lanceolate, stipitate, silky-tomentellous with rust-coloured hairs; style glabrous; ovules 4–6. Legume stalked, compressed, oblique-orbicular 2½–3½ in. in diam.; wing of the fruit papery, reticulate, slightly rusty tomentellous.

Readily distinguished from *Pterocarpus tinctorius*, Welw., by the form and nervation of the leaflets, and by much longer and more slender pedicels of the flowers (l.c.).

Ill.—Hook. Ic. Pl. t. 2369; Engl. & Drude, Veg. Erde, ix. p. 593.

Barwood or Redwood.

West Tropical Africa.

Used as a dye by the natives of the Gaboon and other parts of W. Africa. In the Cross River region Barwood is used by the native women to smear their bodies.

Its chief use in this country is as a red or red brown dye. The colouring matter appears to be the same as that of camwood (*Baphia nitida*) but much inferior. The dye is seldom if ever used alone, being chiefly employed to give the requisite red tone to browns and other colours which contain a red in their composition, and as a foundation for indigo (Jarmain, in Journ. Soc. Arts, xxiv. 1876, p. 988). See Camwood for use in preliminary dyeing operations.

Barwood is imported in billets, of varying size; originally they averaged 60 or 70 to the ton or upwards of 30 lbs. in weight each, later 100 to 120 to the ton, and finally the average size became 380 to 400 or between 5 and 6 lbs. each (Walker, Journ. Soc. Arts, xxiv. 1876, p. 591).

The price appears to have always been low, in 1850 it averaged 6*s.* to 10*s.* per 100 billets; in 1876, 6*s.* to 8*s.* for the same number [in Gaboon], and in Europe £3–5*s.* to £3–15*s.* per ton (l.c.). In 1906 it was valued in Liverpool at £2–15*s.* per ton (Hillier, Kew Bull. 1906, p. 375), and in 1909 it realised £3–7*s.*-6*d.* per ton at Liverpool (Rayner & Co. W. C. Afr. Prod. Rep. 6th Aug. 1909).

Although formerly of some importance it now appears to be practically unsaleable in this country (Hillier, l.c.)

The natives near Ododobo, Cross River, prepare the dye for colouring their bodies in the following way: the dry wood is cut up into small chips, pounded with stones in circular holes cut [or worn ?] in the solid rock. After being well pounded in a dry state it is sieved through a small basket, and the coarse stuff remaining again pounded. The disintegrated bark is then pounded in a moist state, made into cakes (about 12 in. × 9 in. × 3 in.), and dried. The work is done chiefly by the women.

Billington observed a similar method at Frufa (Report Expedition to Cross River, in Africa No. 1, 1895, p. 31).

The trunks of Barwood are cut out into canoes by the natives of the Oil Rivers and the countries further south to Batanga, &c. (Walker, in Report Bot. St. Aburi, 31st Dec. 1892). The wood from this region is also used at Sheffield for making knife handles (Director Kew, 2nd Oct. 1891, to Colonial Office).

The dye-wood weighs 48 lbs. per cubic foot, calculated from the specific gravity (·7785) of a commercial sample in the Kew Museum, from the Gaboon.

There has been considerable confusion in the nomenclature of Barwood and Camwood, but the woods are easily distinguished, since Camwood is heavier (see *Baphia nitida*) and Barwood lighter than water.

Ref.—"Barwood: The Commerce of the Gaboon," Walker, in Journ. Soc. Arts, xxiv. 1876, pp. 590–591.——"Barwood (*Pterocarpus Soyauxii*, Taub.)," Hillier in Kew Bull. 1906, pp. 373–375.

Pterocarpus tinctorius, *Welw.*; Fl. Trop. Afr. II. p. 239.

Vernac. names.—Tacûla or Tucula (Angola, *Welwitsch*, *De Wildeman*); Hûla, Mubiri or Lucula (Golungo Alto, *Welwitsch*); Muangue (Pungo Andongo, *Welwitsch*).—Redwood.

Mamu, Ife and Ilesha Forests, W. Province, S. Nigeria; Angola.

Wood and root yields a dye similar to that of Barwood; the colouring matter in the root is said to exist in greater proportion and to be more deeply coloured than that in the wood (Hiern, Cat. Welw. Afr. Pl. i. p. 278). In Pungo Andongo, newly-born children are frequently painted all over as soon as possible with the red dye made from the pounded root, and stylish ladies on festive occasions never appear without having their feet coloured with the dye to imitate shoes or slippers. The pounded root also furnishes a drug in general use among the natives of Angola, as the principal panacea for the cure of illness, and mixed with various vegetable and mineral substances, the sawdust is used in the composition of charms and for the decoration of the body; it is sold in all the markets and all the native tribes believe in its virtue (l.c. p. 279). In Sierra Leone the ground-up dye wood of this species from S. Nigeria is used in preference to that of

Camwood (*Baphia nitida*), (Unwin, Rep. Forests Sierra Leone, 1909, p. 10), and in the Western Province, S. Nigeria, it is said to be frequently used instead of the real Camwood (Thompson, Col. Rep. Misc. No. 51, 1908, p. 4).

The wood is described as blood-red in some cases, whitish in others, the colour developing as the tree gets old ; valuable for joiners' work (Hiern. l.c.) ; used for posts in St. Thomè, and recommended for shingles (Dennett, S. Nigeria Govt. Gaz. Oct. 1906, Suppl. "For. Work, W. Div.").

Found in the Mamu forests as a fairly lofty tree (Thompson, Col. Rep. Misc. No. 51, 1908, p. 4) ; in the Ife and Ilesha forests (l.c. p. 6) confined to the moist evergreen forests in S. Nigeria (l.c. p. 26), in mountainous forests especially on slopes near the banks of the river Lifune and in the dense primitive forests at the base of the mountains of Serra de Alto Queta, Angola (Hiern, Cat. Welw. Afr. Pl. i. pp. 278, 279).

Pterocarpus sp. (probably *P. erinaceus*, Poir., but the specimen in the Kew Herbarium has neither fruits nor flowers).

Vernac. name.—Maidobia (Hausa, *Dudgeon*) ; Madobia (Hausa, *Dalziel* ; Zaria, *Parsons*) ; Yinyamhi (Fufulde, *Dalziel*).

Kano (Dudgeon, No. 3, 1909, Herb. Kew) ; Zaria (Parsons, N. Nigeria Gaz. April 30th 1910, p. 102) ; Yola (Dalziel, Kew Bull. 1910, p. 137).

One of the trees producing Danko—a Hausa name applied to the exudations of various trees. The Danko from Maidobia is of a ruby-red colour and resembles the kino obtained from *Pterocarpus erinaceus.* It is used medicinally as an abortifacient (Dudgeon, N. Nigeria Gaz. July 31st 1909, p. 161). The tree produces a gum and the wood is used for making bows, Zaria (Parsons l.c.).

Pterocarpus sp. (Leaf specimens only in the Kew Herbarium.)

Vernac. names.—Osun-dudu (Yoruba, *Dudgeon*) ; Iro-usun-dudu (Fiditi (Ibadan), Letter, Director Imp. Inst. to Director Kew June 7th 1909).—Black Camwood (l.c.).

Nupe ; Yoruba (Dudgeon, N. Nigeria Gaz. July 31st 1909, p. 161).

For particulars of the preparation and use of the dye wood, see "Osun Pupa" (*Pterocarpus Osun*).

A specimen of the heart-wood of Osun dudu, from Fiditi in the Museum at Kew has a specific gravity 0·8625=53·9 lbs. per cubic foot, which cuts it off from *Baphia nitida*, suggested by the name Black Camwood, and indicates *Pterocarpus erinaceus.*

LONCHOCARPUS, H. B. & K.

Lonchocarpus cyanescens, *Benth.* ; Fl. Trop. Afr. II. p. 243.

Ill.—Hook. Ic. Pl. t. 1791 ; Kew Bull. 1888, p. 268 ; Ann. Inst. Col. Marseille, ix. 1902, t. 5 ; Engl. & Drude, Veg. Erde, ix. f. 661.

Vernac. names.—Elu (Yoruba, *Moloney*) ; Elu (Lagos, *Dawodu*) ; Echi (S. Nigeria, *Baily*) ; Gara (Sierra Leone, Bull. Imp. Inst. 1907, p. 129) ; Gera (Gonga, *Armitage*) ; Ngeparsa or Negepassa (Sierra Leone, *Scott Elliot*) ; Nialé (Mendi, *Scott Elliot*).——Yoruba Indigo ; West African Indigo.

Yoruba ; Nupe : Old Calabar, and in general extending in West Africa from Senegambia to Fernando Po.

The leaves and young shoots yield a blue dye, shown by Perkin to be identical with that furnished by several species of *Indigofera* (S. Nigeria Govt. Gaz. July 14th 1909, Suppl. p. 28).

The bulk of the Indigo used by the natives of the W. Province, S. Nigeria is obtained from this plant (Thompson, Col. Rep. Misc. No. 51, 1908, p. 5).

Indigo prepared by the natives of Kontagora, was found to contain about 21·5 per cent. of indigotin, and therefore of poor quality in comparison with Indian or Java Indigo (*Indigofera tinctoria*, and *I. arrecta*), which may contain up to 80 per cent. of indigotin. The dried plant as used at Oshogbo, W. Province, S. Nigeria, was found to contain only 0·65 per cent. of indigotin (Bull. Imp. Inst. 1909, p. 319).

In Sierra Leone the prepared plant is soaked in water for about 12 hours, and the yellowish liquid is then thrown away, the wet residue being allowed to ferment for two or three days. During this period of fermentation, powdered root bark of the "brimstone" tree (*Morinda citrifolia*), is added together with some potash. Water with a decoction of the Morinda bark and more potash is then added. The mixture is then left exposed to the sun all day and stirred from time to time, but is covered up at night and after about nine days time is ready for use. The fabric to be dyed is left in the liquid for some time and then dried in the sun, and the operation is repeated until the required shade of blue is obtained (Bull. Imp. Inst. 1907, p. 129).

The dye is prepared by the natives from the young leaves which are pounded in a mortar into a black pasty state ; this is made into balls, four or five inches in diameter, dried, and is then ready for the market. One ball to a gallon of water is used in dyeing ; the cloth is immersed for four days, the dye is fixed with potash, and a very permanent and fine deep blue is thus obtained (Barter, Herb. Kew ; Kew Bull. 1888, p. 75 ; Hook, Ic. Pl. t. 1791). The process is somewhat similar in Sierra Leone (Scott Elliot, Herb. Kew).

A method patented several years ago in France is as follows :—The leaves are cut up into small pieces, fermented in water for from seven to twelve hours, according to the temperature, and pressed through a filter. The clear, colourless liquid is then precipitated with lime—air being blown through the mass—and the indigo is obtained in a solid state. To bring all impurities into solution and to facilitate the settling of the indigo the lime vat is boiled for a quarter of an hour at the end of the oxidation process. The liquid is then decanted and the indigo blue made into cakes which are dried in the shade in the open air (St. James' Gazette, March 29th, 1902).

In England the dye from this plant has been valued at 4*s.* to 4*s.* 6*d.* per lb., compared with fine Bengal then (1883) worth from 7*s.* to 7*s.* 6*d.* per lb. (Thistleton-Dyer, Journ. Linn. Soc. xx. p. 406).

The root has been mentioned as a possible cure for leprosy, and a stomach medicine is obtained from the plant, Sierra Leone (Scott Elliot, Herb. Kew).

The plant is common near rivers, found as a twiner 30 feet high near the river in Nupe (Barter, Herb. Kew). There are plantations of several hundred acres in Abeokuta. Under cultivation the plants are kept about seven or eight feet high, being spurred and bushy with regular cutting (Kew Bull. 1888, p. 75).

Ref.—"West African Indigo," Thiselton-Dyer, in Journ. Linn. Soc. xx. 1884, pp. 404–406.——"Yoruba Indigo" (*Lonchocarpus cyanes-*

cens, Bth.), in Kew Bull. 1888, pp. 268–269.——"West African Indigo," in Forestry of West Africa, Moloney, pp. 153–156.——"West African Dyeing," Maguire, in Journ. Afr. Soc. Jan. 1906, pp. 151-153.——"The Occurrence of Indigo in the Gara Plant of Sierra Leone," in Bull. Imp. Inst. 1907, pp. 129–130.——"Report by the Imperial Institute on Indigo Plant from Southern Nigeria," Dunstan, in Govt. Gaz. S. Nigeria, Suppl. July 14, 1909, p. 28.

Lonchocarpus laxiflorus, *Guill. & Perr.*; Fl. Trop. Afr. II. p. 242.

Ill.—Peters, Mozamb. t. 5 (*Capassa violacea*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 50, f. B.

Vernac. names.—Mowaleh (Madi, *Grant*); Panda (Ironga, Lorenzo Marques, *Sim*); Homohomo (Swazi, *Sim*).

Kontagora (Dalziel No. 13, 1906, Herb. Kew). Widely distributed in Tropical Africa—Senegambia through Abyssinia to Mozambique.

Wood valuable and very durable according to Wiesner (Rohstoffe, Pflanzenreiches, ii. p. 90) and Engler (Pflan. Ost Afr. B. p. 310); but Sim (For. Fl. & For. Res. Port. E. Afr. pp. 45, 127) states that the timber is quite useless and not durable. There is no specimen of the wood in the Museum at Kew.

The flowers are described by Grant (Trans. Linn. Soc. xxix. p. 63) as lilac-coloured and scented, and Sim (l.c.) as rather pretty and Wistaria-like.

The plant reproduces itself freely from seed and the cut roots (l.c. p. 45).

Lonchocarpus sericeus, *H.B. & K.*; Fl. Trop. Afr. II. p. 241.

Ill.—Pal. de Beauv. Fl. Ow. Ben. ii. t. 76 (*Robinia violacea*).

Vernac. names.—Apapo or Ipapo (Lagos, *Punch*, *Elgee*); Ipapo (S. Nigeria, *Foster*; Yoruba, *Thompson*); Mutala-Menha (Angola, *De Wildeman*); Ossani (Gaboon, *Moloney*).

Ibadan Forest Reserve, Abeokuta, Lagos, Oloke-Meji, Nupe, Zungeru, and extending in West Africa from Senegambia to Angola.

Timber used for building, Ibadan (Punch, Herb. Kew); suitable for constructional work, cabinet work and turnery; very hard, durable, and stands well under water (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 370). Branches used for hoe-handles in S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 5).

The bark on the Gaboon is used medicinally in abdominal complaints and as a laxative (Moloney, For. W. Afr. p. 325; Cat. Prod. Col. Franç. Exp. Univ. 1867, p. 47); also in S. Nigeria (Thompson, l.c.).

A tree 30–40 ft. high; common on the banks of streams and nullahs, and also found as a shrub 6–10 ft. high on the Accra plains.

BAPHIA, Afzel.

Baphia nitida, *Afzel.*; Fl. Trop. Afr. II. p. 249.

Ill.—Lodd. Bot. Cab. t. 367.

Vernac. names.—Irosun (Lagos, *Punch*); Irosun or Iguronin (Lagos, *Millen*); Owinu (Lagos *Rowland*); Awenu or Irosun (Lagos, *Dawodu*); Otwa (Benin, *Dennett*); Odwen (Akwapim, Gold Coast, *Thompson*); Bundoi (Sierra Leone, Kew Bull. 1906. p. 374); Mat, Kam or Bendwi (Mendi, Sierra Leone, *Unwin*).—Camwood.

Lagos; Abeokuta; Benin; Old Calabar; Ododobo (Cross River), and extending in West Africa from Sierra Leone to Fernando Po.

The heart-wood yields the Camwood of Commerce, used as a red or red-brown dye. It is the best of several dye woods used for putting a "bottom" on wool or wollen fabrics to give a special "bloom" when they are dyed with indigo. The goods are boiled with the dye for an hour or an hour and a half, no mordant being used—16 lbs. of Camwood for 100 lbs. of wool is a good proportion for a full bottom (Jarmain, in Journ. Soc. Arts. xxiv. 1876, p. 968). It was formerly imported in short logs, 15 to 20 in. long, 5 to 12 in. in diameter, and wood of this class was in request for high-class fancy turnery; latterly it has been sent in irregularly shaped pieces of no value except for dyeing purposes. It usually fetches a good price (Director, Kew, to Colonial Office, 2nd Oct. 1891). Best Camwood (about 1859) from near Sierra Leone was valued at £25 per ton (Barter, Mus. Kew); in 1876 between £20 and £33 per ton (Walker, Journ. Soc. Arts. l.c. p. 591), in 1885–1886 some sold at £29 per ton (Director, Kew, l.c.), in 1907 it was valued at £10 to £15 per ton, from Liberia (Cons. Rep. Ann. No. 3750, 1907, p. 10). The value now fluctuates between £5 and £12 per ton, and the industry appears to be almost if not quite neglected (1909).

Camwood appears to be used by the natives in the same way as Barwood (*Pterocarpus Soyauxii*), and the dye woods of other species of *Pterocarpus* (*q.v.*). It is sold as Barwood in Lagos (Punch, Herb. Kew).

It has been suggested that the colouring matter of the wood is due to some destructive organism, but examination of the wood shows nothing abnormal (Col. Rep. Ann. No. 630, 1909, p. 40).

Used in Sierra Leone for parasitic skin diseases (Johnston, Mus. Kew).

The specific gravity varied in different samples examined from 0·9065 (bark, sapwood and heartwood) to 1·105 (heartwood only) equal to 56·65 and 69 lbs. per cubic foot respectively.

It is very durable, and is used in Liberia by the natives for making beams and pillars (Cons. Rep. Ann. No. 3750, 1907, p. 10); for walking-sticks in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 36); and (wood of "Irosun") in Lagos for making pestles (Colonial Office to Kew, Aug. 6th, 1898, Enc. No. 66, in Despatch, Acting Governor, Lagos, June 28th, 1898, to Sec. of State).

May be propagated by seed, though as a garden plant in this country, Loddiges (Bot. Cab. l.c.) nearly a century since, says, "It may be increased by layers or cuttings, thriving in a rich loamy soil." The tree appears to be extensively cultivated around villages in S. Nigeria; and is also found fairly commonly in West Africa in the evergreen forests, between the coast forests of the swamps and the dry forests of the interior, varying from a shrub 6–10 ft. high to a small spreading tree 20 ft. high.

Baphia pubescens, *Hook f.*; Fl. Trop. Afr. II. p. 250.

Vernac. names.—Awewi (Lagos, *Millen*); Ositwa (Benin, *Foster*); M'Pano (W. Africa, *Moloney*).—Camwood (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 378).

Onitsha; Lagos; Agege (W. Prov. S. Nigeria); Benin; Idio River (S. Nigeria); Dekina (N. Nigeria); Banks of Gurara River (N. Nigeria).

Wood valuable, chiefly used in dyeing (Moloney, For. W. Afr. p. 327); heavier than water, fine grain, white, turning red on exposure to the air with odour of violets (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 378).

A specimen of the wood (including bark) in the Museum at Kew, from the Gold Coast has sp. gr. 0·967 = 60·5 lbs. per cubic foot.

ORMOSIA, Jacks.

Ormosia laxiflora, *Benth.*; Fl. Trop. Afr. II. p. 255. [*Afrormosia laxiflora*, Harms.].

Ill.—Engl. & Drude, Veg. Erde, ix. f. 675.

Vernac. names.—Shedun (Yoruba, *Thompson*; Oloke-Meji, *Foster*); Makarfo (Hausa, *Dalziel*); Kobin (Gold Coast, *Thompson*); M'banga (Golo, Sudan, Bull. Imp. Inst. vii. 1909, p. 23); Simbach, Dobole, Koulou-Koulou, and Fa (various localities in French W. Africa, *Chevalier*).

Nupe; Jeba; Lokoja; Lagos.

The wood is described as being of walnut colour, and striking figure where curly, hard, cross-grained and aromatic. The sapwood is ½ in. wide light yellow and sharply defined from the heartwood. The bark is about ¼ in. thick, nearly smooth and of reddish brown colour, scaling in small fragments; weight 57¾ lb. per cubic foot; suggested as a substitute for Walnut (*Juglans regia*) (Bull. Imp. Inst. l.c.), and an excellent wood for cabinet work and turnery (Chevalier, *seq.* p. 113); used for house posts in S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 5, *Druosia laxiflora*); and for axe-handles in Yola (Dalziel, Herb. Kew).

An infusion of the leaves is used in French West Africa to facilitate the teething of infants, and for the cure of lumbago (*seq.* p. 114).

Ref.—"*Ormosia laxiflora*, Benth." in Les Veg. Utiles de L'Afrique Trop. Franç. Chevalier, Perrot & Gérard, Fasc. iii. pp. 110-114 (Challamel, Paris, 1907).

SWARTZIA, Schreb.

Swartzia madagascariensis, *Desv.*; Fl. Trop. Afr. II. p. 257.

Ill.—Sim, For. Fl. & For. Res. Port. E. Afr. t. 52.

Vernac. names.—M'nyembeh (Madi, *Grant*); Mucombé (Pungo Andongo *Welwitsch*); Mucombe (Angola, *De Wildeman*); Chinyenye (Nyasaland, *Purves*); Naquada (Echuabo, Quelimane, *Sim*); N'dota (Rhodesia, *Allen*).

Nupe; Banks of Lake Chad; Kilba Country, Yola Province; and extending across Tropical Africa to Nyasaland, Mozambique, Rhodesia, &c.

Wood hard and very heavy, deep red in colour (Barter, Herb. Kew); of medium quality (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 369); weight over 60 lbs. per cubic foot, very dense, rings and rays absent, pores minute, excellent for piano manufacture, good for all high class furniture work, suitable for any heavy hard-wood work, and in general a very valuable timber, durable and not liable to damage by white ants (Sim, For. Fl. & For. Res. Port. E. Afr. p. 119). The natives of French West Africa use it for piles and stockades (Chevalier, *seq.* p. 126). The specific gravity of the heartwood is given at 1·03, that of the sapwood 0·949 (l.c.).

Pods used as rattles and for ornamental purposes, Batoka country (Kirk, Herb. Kew).

Propagated by seeds. Found as a tree from 12–30 ft. high, Nupe; in Rhodesia growing in sandy soil at 4500 ft.

Ref.—"*Swartzia madagascariensis*, Desv," in Les Veg. Utilés de L'Afrique, Trop. Franç. Chevalier, Perrot & Gérard, iii. pp. 124–127.

LEGUMINOSAE——CAESALPINIAE.

CAESALPINIA, Linn.

Caesalpinia Bonducella, *Roxb.*; Fl. Trop. Afr. II. p. 262.

Ill.—Rheede, Hort. Mal. ii. t. 22; Rumpf, Amb. v. t. 49, f. 1 (*Globuli majores*); Hughes, Hist. Barbados, t. 18; Velloso, Fl. Flum. iv. t. 91 (*Guilandina Bonduc*, Ait.); Mart. Fl. Bras. xv. pt. 2, t. 21; Bentl. & Trimen, Med. Pl. t. 85; Sinclair, Indig. Fl. Hawaiian Is. t. 31; Engl. & Prantl, Pflan. iii. pt. 3, f. 94 (after Bentl. & Trimen); Contr. U.S. Nat. Herb. ix. t. 51 (*Guilandina crista*); Brandis, Ind. Trees, p. 246 (pod).

Vernac. names.—Shayo (Lagos, *Foster*, *Dawodu*); Kakalaira (Hawaii, *Sinclair*, *Safford*); Calumbibit (Tagalog, Philippines, *Bacon*); [Calambit, Bayag Cambing (Philippines), Anaoso (Samoa), Pacao, Pakeo (Guam), Tataramoa (Raratonga), Guacalote Prieto (Cuba) *Safford*], Graines-tiques (French Guiana, *Heckel*).——Bonduc Nut; Fever Nut; Nicker Nut; Molucca Bean; Guilandina Seeds; Horse Nicker; Chick Stone Tree; Benzor Nut; Physic Nut.

Common on the tropical shores of both hemispheres.

The seeds are very buoyant and drift for long distances; they are occasionally washed up on the shores of Ireland, Scotland, Norway, &c. They are used largely for ornamental purposes—bracelets, necklaces, rosaries, &c. (Mus. Kew), and in India, generally mixed with black pepper, they serve as a tonic and febrifuge; a powder of the seed is administered in cases of malarial fever—dose 10–15 grains. The bitter principle according to Dr. Isnard is as efficient as quinine. (Second Rep. Indig. Drugs Committee, Simla, 1909, p. 51.) The natives in the Philippines regard the seeds as a good medicine for stomach troubles; an adult will eat from 10 to 12 nuts, and if there is no relief in an hour or two the dose is repeated; the dosage for youths and infants is in proportion (Bacon, Philippine Journ. Sci. 1906, p. 1033). The root bark is used as a tonic and for various medicinal purposes (Moloney, For. W. Afr. p. 328, Bentl. & Trimen, Med. Pl. No. 85), and the roots in French Guiana are used for the cure of gonorrhoea (Heckel, Ann. Inst. Col. Marseille, 1897, p. 116). The seeds may be purchased in the Philippines at 10 cents per lb. and the native boys use them in a game similar to marbles (l.c.). The native boys of Sierra Leone play with them a game called "Warree Warree" (Mus. Kew) and they are sometimes used in "Mancala," the national game of Africa (Culin. Smithsonian Rep. U.S. Nat. Mus. 1894, p. 597).

The plant is grown largely as a fence for kraals and gardens in Pondoland (Sim, For. Fl. Cape Colony, p. 208).

Ref.—"Semen Bonducellae" in Pharmacographia, Flückiger & Hanbury, pp. 211–213.——"*Caesalpinia Bonducella*" in Med. Pl. Bentley & Trimen, ii. No. 85, 4 pages (J. & A. Churchill, London, 1880).——"Nouvelles recherches sur les Bonducs et leur graines febrifuges," Heckel in Journ. "Les New Remèdes," 1886.——*Caesalpinia Bonducella* in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 3–6.——"*Caesalpinia Bonducella*," in Pharmacog. Indica, Dymock, Warden & Hooper, i. pp. 496–499 (Kegan Paul, Trench, Trübner & Co., Ltd., London, 1890).——"Mancala The National Game of Africa," Stewart Culin, in Smithsonian Rep. U.S. Nat. Mus. 1894, pp. 597–607.——"*Caesalpinia Bonducella*": "The Physiologically active constituents of certain Philippine Medicinal Plants," Bacon, in the Philippine Journ. Science, i. 1906, pp. 1032–1034.——"*Caesalpinia Bonducella*," in Comm. Prod. India, Watt, pp. 190–191.

Caesalpinia coriaria, *Willd.* Sp. Pl. ii. p. 532.

A small, glabrous, unarmed tree. Leaves bipinnate; pinnae 6–8-jugate; leaflets 15–20–jugate, opposite, linear, obtuse, very shortly petioled. Panicle terminal about an inch long. Flowers shortly stalked, yellow. Calyx subequally 5-lobed. Petals 5, subpapilionaceous. Stamens 10. Ovary shortly stalked, glabrous. Pod oblong, sinuous, 1½–2 in. long, about ½ in. broad, glabrous, septate, mesocarp spongy.

Ill.—Kunth, Voy. Humb. & Bonpl. Mimosa t. 45; Tropenfl. 1901, p. 86, p. 87 (Plantation in the experimental garden, Dar-es-Salam, G.E. Africa); Wiesner, Rohstoffe Pflanzen. ii. p. 84, f. 262 (pods).

Vernac. names.—Libi-dibi (Bombay, *Watt*); Cascalate (Mexico); Sumáque-Amriquah (Arabic, and Persian, *Watt*).

Divi-Divi: American Sumach.

Indigenous in Central and South America. Cultivated in Australia, Java, India, German East Africa, &c.

The pods are an important tanning material; they yield a medium, light-coloured, fairly heavy and firm leather, but the use is limited by the liability to fermentation of tanning liquors prepared from it. (Bull. Imp. Inst. 1904, p. 276.)

The wood is hard and heavy—weight 74 lbs. per cubic foot; the sapwood is greyish-white, the heartwood nearly black; the rate of growth is fairly fast, 6 rings per inch of radius (Gamble, Man. Ind. Timb. p. 268).

May be propagated by seed, which may be sown in bamboo pots, or in nursery beds and transplanted when about 5 or 6 months old. The distance apart in permanent places will require to be 10 to 15 feet, and finally about 30 feet. The principal reqnirements are good soil —though it will grow on comparatively poor soil—moderate rainfall, a warm climate, and careful pruning.

The trees begin to bear in 3 to 4 years after transplanting and yield about 5 lbs. of pods per tree (Indian Forester, ix. p. 103). They continue to yield pods in profitable quantities for about 25 years (Bull. Imp. Inst. 1904, p. 276), and trees 15 feet apart (192 per acre) yield 8½ cwt. of pods; 10 feet apart (436 per acre) 19½ cwt. of pods per annum (Indian Forester, l.c.). In Curaçoa the yield of pods from one tree is given at 40 lbs. to 80 lbs. annually (Versluys, Agric. News, Barbados, 1907, p. 159); in India, when in full bearing there is an average yield of 100 lbs. per tree, which at 135 trees per acre equals about 6 tons of pods (Agric. Ledger, No. 10, 1899, p. 2).

In preparation for the market the seeds should be removed, and the pods carefully dried and graded before shipment.

Pods from the Gold Coast have been found to contain 33·10 per cent. of tannin (Agric. News, Barbados 1909, p. 124), while 30 to 50 per cent. is given for American, and about 30 per cent. for Indian pods (Bull. Imp. Inst. l.c.)—valued at £5 per ton with West Indian and South American at £9 to £11 per ton (Agric. News, l.c.)

The pods are shipped largely from the Island of Curaçoa, and the mainland of Venezuela and Colombia, valued at about ¼*d.* to ½*d.* per lb. [1,090,602 kilos value £4550 18*s.* 4*d.* Curaçoa 1900 (Cons. Rep. Ann. No. 2902, 1902, p. 12); 488,540 kilos, value £3256 18*s.* 4*d.*, Curaçoa 1905 (l.c. No. 3894, 1907, p. 8)].

There appears to be no record of any attempt to value this product in Nigeria, although some plants were sent from Kew to Lagos in 1887 which 2½ years later were stated to be fine spreading trees (Kew Bull. 1890, p. 162).

Divi-divi like all tanning materials is not acceptable to tanners unless quantity as well as quality can be assured.

The quality of the timber is a good recommendation for the culture and may prove sufficiently valuable when the trees get old, to compensate for any failure that may arise in growing the tree as a tanning material, the low price of which would leave apparently little margin for profit.

Ref.—" The Divi-Divi (*Cesalpinia coriaria*)," Mukharji, in Indian Forester, ix. 1883, pp. 99–103.——" *Caesalpinia coriaria:* The American Sumach or Divi-Divi " in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 6–9.——" The Divi-Divi Tree," Cowley, in Queensland Agric. Journ. i. 1897, pp. 139-140.——" *Caesalpinia coriaria*, Divi-Divi " : A Note on the Cultivation of the Plant in India and the value of the pods as a tanning material, in Agric. Ledger, No. 10, 1899, pp. 1–19.——" Dividivi in Deutsch-Ostafrika," Warburg, in Der Tropenpflanzer, 1901, pp. 85–89.——" Dividivi," in Die Rohstoffe des Pflanzenreiches, Wiesner, ii. pp. 840–844 (Wilhelm Engelmann, Leipzig, 1903).——" Pods of *Caesalpinia coriaria*, Divi-Divi," from India, in Bull. Imp. Inst. 1904, pp. 92–93, with analysis.——" The Culture of Divi-Divi," Versluys in Agric. News, Barbados, 1907, p. 159 ; reprint in Queensland Agric. Journ. xix. 1907, pp.160–161.

Caesalpinia pulcherrima, *Sw.* ; Fl. Trop. Afr. II. p. 262.

Ill.—Zanoni, Hist. t. 141 (*Poinciana flore pulcherrima*) ; Rheede, Hort. Mal. vi. t. 1 (*Poinciana pulcherrima*) ; Gaertner, Fruct. Sem. Pl. ii. t. 150 (*P. pulcherrima*) ; Bot. Mag. t. 995 (*P. pulcherrima*) ; Lam. Encycl. t. 333 (*P. pulcherrima*) ; Desc. Ant. i. t. 6 (*P. pulcherrima*) ; Rchb. Mag. Bot. t. 93 (*P. pulcherrima*) ; Velloso, Fl. Flum. iv. t. 90 (*P. pulcherrima*) ; Geel, Sert. Bot. iv. (*P. pulcherrima*) ; Mag. Bot. and Gard. ii. t. 23 (*P. pulcherrima*) ; Blanco, Fl. Filip. t. 112 *P. pulcherrima*) ; Rchb. Exot. ii. t. 130 (*P. pulcherrima*) ; Paxton, Mag. iii. p. 3 (*P. pulcherrima*) ; Knowles & Westcott, Fl. Cab. and Mag. Exot. Bot. ii. t. 89 (*P. pulcherrima*) ; Maund, Bot. Anist. iv. t. 151 ; Spach, Suites (Hist. Nat. des Vegetaux) t. 2, f. 2 (*P. pulcherrima*) ; Ralph, Ic. Carp. t. 19, f. 8 (*P. pulcherrima*).

Vernac. names.—Malosa (Pungo Andongo, *Welwitsch*) ; Macata (French Guiana, *Heckel*) ; [Caballero (Guam.) ; Flor de Cameron, Chacalxochitl (Mexico) ; Gallito (Panama) *Safford*] ; Clavellina (Porto Rico, *Cook & Collins*) ; Poincillade (Antilles, *Descourtilez*).—Paradise Flower ; Peacock Flower ; Peacock's Crest ; Barbados Pride ; Barbados Flower Fence.

The plant is used medicinally, all parts of it being described as a powerful emmenagogue, and in odour and uses resembling Savin (Bot. Mag. t. 995) ; the leaves and flowers in decoction for fevers in the West Indies ; the pods and leaves as a substitute for senna in the East Indies (Mus. Kew), in Guam (Safford, Pl. Guam, p. 358), in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 124), and in Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 193). A decoction of the root is used in Angola for the cure of intermittent fever (Hiern, l.c.).

The plant is largely grown for decorative purposes and as a hedge plant in the tropics, and forms a most beautiful fence when mixed with *Parkinsonia aculeata* (Bot. Mag. l.c.).

The cultivation is easy, grows freely from seeds and flowers nearly the whole year round.

Caesalpinia Sappan, *Linn.* Sp. Pl. (1753), p. 381.

A small tree. Prickles small and few. Leaf-rachis $\frac{1}{2}$ to 1 ft. long; leaflets close, sessile, subcoriaceous, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, attached at the lowest corner. Panicles often as long as the leaves, the young branches slightly ferrugineo-pubescent; bracts large, lanceolate, caducous; pedicels $\frac{1}{2}$ to $\frac{5}{8}$ in. long. Calyx $\frac{3}{8}$ in. long, glabrous. Pod 3 to 4 in. by $1\frac{1}{2}$ in.; sub-compressed, polished, with a hard recurved beak at the upper angle, 2 to 4 seeded (Fl. Br. India, ii. p. 255).

Ill.—Rheede Hort. Mal. vi. t. 2 (*Tsja-Pangam*); Rumpf, Amb. iv. t. 21 (*Lignum Sappan*); Gaertner, Fruct. Sem. Pl. ii. t. 144; Lam. Encycl. t. 335 (*C. Bresillet*); Roxb. Pl. Corom. i. t. 16; Bedd. Fl. Sylv. (Anal. Gen.) t. 13, f. 1; Vidal, Fl. For. Filip. t. 42C (pod and parts of fl.), t. 43E (leaf); Greshoff, Nutt. Ind. Pl. t. 29; Brandis, Ind. Trees, p. 246 (pod).

Vernac. names.—Kayu Spang (Sarawak, Mus. Kew); Mai Krak (Korat District, Siam, *Beckett*); Kaya Kedrang (Malacca, Mus. Kew). —Sappan Wood; Sampfen Wood; Bakam Wood; Brazilian Wood; Redwood.

The wood yields a red dye, and it is exported in billets, chiefly from Siam and the Philippines. It is not now, apparently, of special importance. The imports into this country are quoted since 1888 in the Customs Returns, under Dyewoods unenumerated, of which the total quantity from Foreign Countries and British Possessions (*e.g.* 4210 tons, value £35,692) in 1909 (Trade of the United Kingdom, i. 1910, p. 107) was less than "Logwood" (*q.v.*). The Philippine production appears to go largely if not entirely to China—the whole export from Iloilo (51,842 piculs=3240 tons, value £8997) in 1904 all went to Hong Kong (Cons. Rep. Ann. No. 3512, 1905, p. 28). It weighs 46 to 61 lbs. per cubic ft. (Gamble, Man. Ind. Timb. p. 267), and the colouring matter is readily soluble in hot water. One of the trees being propagated for distribution by the Department of Agriculture in S. Nigeria.

Ref.—"*Caesalpinia Sappan*," in Dict, Econ. Prod. India, Watt, ii. 1889, pp. 10–12.——"*Caesalpinia Sappan*," in Nuttige Indische Planten, Greshoff, pp. 121–124 (J. H. De Bussy, Amsterdam, 1894).——"Sappanholz," in Die Rohstoffe des Pflanzenreiches, Wiesner, ii. pp. 934–935 (Wilhelm Engelmann, Leipzig, 1903).——"Sappan Wood," in Timbers of Commerce, Stone, pp. 70–71 (W. Rider & Son, Ltd., London, 1904).——"*Caesalpinia Sappan*," in Comm. Prod. India, Watt, pp. 194–196.

POINCIANA, Tourn.

Poinciana regia, *Boj.* ex *Hook. f.* Bot. Mag. t. 2884.

A tree 30 to 40 ft. high, trunk up to 3 ft. in diameter, with grey, smooth bark, unbranched below and with a wide crown. Leaves 2 ft. long, with 11–18 pairs of pinnae; petioles swollen at the base. Flowers bright scarlet marked with yellow, in lax, terminal or axillary racemes about 1 ft. long. Petals nearly orbicular, patent-reflexed, tapering into long claws ; crenate at the margin. Stamens 10, shorter than petals ; filaments red ; anthers oblong ; 2-celled. Pod woody, about 2 ft. long, 2 to 2¼ in. broad, containing up to 45 seeds. Seeds ¾ in. long, colour greyish changing to brown.

Ill.—Bot. Mag. t. 2884 ; Rchb. Exot. v. t. 318 ; Nooten, Fl. Java t. 35 ; Cook & Collins, Contr. U.S. Nat. Herb. viii. pt. 2, t. 54 (habit).

Vernac. names.—Tanahon (Madagascar, *Bojer*).—Flamboyante ; Flame Tree ; Gold Mohur, or Gulmohr Tree.

Native of Madagascar.

A very handsome tree, grown throughout the tropics for decorative purposes and as a shade tree ; in Old Calabar it is being largely planted (Report Bot. Gdn. Old Calabar, 1908). The wood is white and soft—28 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 270).

May be propagated by seed and grows freely in good soil. Requires careful pruning to develop a good head.

PARKINSONIA, Linn.

Parkinsonia aculeata, *Linn. ;* Fl. Trop. Afr. II. p. 267.

Ill.—Linné, Hort. Cliff. t. 13 ; Lam. Encycl. t. 336 ; Jacq. Icon. Select. Stirp. Am. t. 80 ; Desc. Ant. i. t. 12 ; Bedd. Fl. Sylv. (Anal. Gen.) t. 13, f. 2 ; Mart. Fl. Bras. xv. pt. 2, t. 26 ; Sargent, Silva, N. America iii. t. 131 ; Bettfreund, Fl. Argent. i. t. 46 ; Eastwood, Trees California, t. 41 ; Plant. Indig. et Exot. Ic. t. 94.

Vernac. names.—Saratani (Katagum, *Dalziel*) ; Retama (California, *Eastwood*, *Sargent*).—Horse Bean ; Jerusalem Thorn ; Genet Epineux.

Native of Trop. America. Naturalized in Africa.

The young shoots yield a fine white fibre though not very strong ; it has been recommended with other substances as half stuff for paper-making (Royle, Fibrous Pl. India, p. 298). The plant by reason of its strong spines, makes an impenetrable hedge. It is used in Senegal for fencing gardens and cattle enclosures (Guillem. Perr. Rich. Fl. Senegamb. i. p. 257). Planted in Native Towns, Katagum (Dalziel, Herb. Kew). See *Caesalpinia pulcherrima* for combination as a hedge plant.

HAEMATOXYLON, Linn.

Haematoxylon campechianum, *Linn.* Sp. Pl. (1753), p. 384.

A small, spreading tree, branches crooked, covered with dark, rough bark. Leaves alternate or apparently fasciculate on stunted branches, pinnate, with 4 (rarely 5) pairs of opposite, shortly stalked, obcordate, smooth, uniform leaflets (rarely bipinnate) ; stipules small, membranous, usually caducous, but in wild and stunted trees persistent, and forming strong sharp spines. Flowers small, in lax, axillary recemes ; Calyx very deeply divided into 5 broad, rounded segments, the anterior one longer than the others, glabrous, purple. Petals 5, yellow, spreading, obovate-lanceolate, smooth, forming a nearly regular corolla slightly exceeding the calyx segments in length, inserted in the mouth of the short, cup-shaped tube of the calyx. Pod, membranous, lanceolate, compressed, pointed at both ends, 1- or 2-seeded.

According to Earle the plant is very variable, showing marked difference in form, colour and texture of leaf, time of blooming, form and extent of the ribs on the trunk, colour of bark and especially in the colour of the heartwood. (Journ. New York Bot. Gdn. iv. p. 3).

Ill.—Sloane, Hist. Jamaica, ii. t. 10, ff. 1–4 (*Lignum campechianum*); Catesby, Nat. Hist. Carolina, Florida, and Bahama Is. ii. t. 66 (*Lignum campechianum*); Plenck, Ic. iv. t. 329; Lam. Encycl. t. 340, f. 1; Desc. Ant. ii. t. 73; Tuss. Ant. iv. t. 36; Hayne, Darst. Beschr. Gewäche, x. t. 44; Nees von Esenbeck, Plant. Medic. Düsseld. t. 342; Woodville, Med. Bot. iii. t. 163; Guimpel, Abbild. Beschr. t. 165; Burnett, Pl. Util. iv. t. 121b; Baillon, Hist. Pl. ii. p. 83, ff. 49–51; Zippel, Ausl. Handels. Nährpfl. t. 32; Bentl. & Trimen, Med. Pl. t. 86; Engl. & Prantl, Pflan. iii. pt. 3, f. 93 A–D; Shattuck, Bahama Is. t. 39 (habit); Bull. Torrey Bot. Club, xxxi. 1904, p. 371, f. 1 (seedlings of "red" and "bastard" logwood, 1 year old), p. 376, f. 2 (flowers of "blue," "red," and "bastard" logwood); Bull. Dept. Agric. Jamaica, ii. 1904, p. 245, f. 1 (seedlings of "red" and "bastard" logwood), p. 249, f. 2 (flowers of "blue," "red," and "bastard" logwood).

Logwood; Peachwood.

The flowers are very attractive to bees. A large proportion of the Jamaica honey is obtained from them (Journ. Jamaica Agric. Soc. 1902, p. 85). "Logwood Honey" is water white (l.c. 1907, p. 65), compares very favourably with "Alfalfa," "Sage," or "White Clover" honey (l.c. 1902, p. 264) and is equal to the purest honey gathered from any bloom whatever in the United States (l.c. 1901, p. 326).

The wood is suitable for posts and cabinet-work. Medicinally it is an astringent, used in the form of decoction in diarrhœa. Its chief use is as a dye, which is obtained from the heartwood and root-stock.

It is tough, hard, and dense—specific gravity 1·057 (Bentley & Trimen, Med. Pl. No. 86), 61 to 67 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 271). A specimen of the commercial dyewood in the Museum at Kew has a proportionate density of 0·972=60·75 lbs. per cubic foot.

Good Logwood shows in cross-section a dark-red colour which deepens on exposure to a colour approaching purple, and a decoction soon becomes highly coloured.

The Logwood cutters in Yucatan distinguish between four varieties of the wood "Tinta Negra," "Tinta Maria," "Tinta Catzim" and "Tinta Amarilla Catzim" according to the dye content (Bucher, Bull. Bot. Dept. Jamaica, 1896, p. 182).

The so-called "bastard logwood" is lighter in colour, does not darken on exposure, and water in which chips are immersed shows little or no purple colour; it is valueless for dyeing purposes. A sample at Kew has sp. gr. 0·8154=50·9 lbs. per cubic foot. This class of wood has been found to contain 6·34 to 6·69 per cent of tannin, of value for tanning book-binding leather (Drabble & Nierenstein, Journ. Inst. Comm. Res. Tropics, Liverpool Univ. April, 1907, p. 40).

The cause of this difference in the wood appears to be uncertain—botanically no differences can be observed, and no distinguishing characters are evident until the trees are cut. Experiments have been undertaken (1903) at Hope Gardens, Jamaica, and the New York Botanical Gardens with seedlings of the trees producing normal and abnormal dye-wood in order to try and ascertain the cause of the occurrence of bastard logwood (Journ. New York Bot. Gdn. iv. 1903, p. 4). A parallel case in this country is met with in "Brown Oak" the cause of which is as yet also unexplained.

The exports from Campeche in 1908 amounted to 5,043,827 kilos, £11,000, and in 1909, 4,446,716 kilos, value £9900 (Cons. Rep. Ann. No. 4418, 1910, p. 5).

The imports into Great Britain, chiefly from Hayti, St. Domingo, Mexico, British W. Indies, and British Honduras, for the past five years (1905–1909), have been 15,254 tons, value £71,508 (1905); 17,991 tons, value £91,941 (1906); 23,105 tons, value £112,744 (1907); 16,952 tons, value £73,472 (1908) and 4985 tons, value £23,886 (1909) (Trade of the United Kingdom, i. 1910, p. 107).

The price per ton varies from about £2 10*s*. to £8 for "Logwood," and £2 10*s*. to £4 for "Logwood Roots."

May be propagated from seed—which it is advisable to select from trees known to produce satisfactory heart-wood—raised in nursery beds or bamboo pots, and planted out in permanent places 15 to 20 feet apart, when about 6–10 months old.

In Jamaica the tree has become naturalized; it grows spontaneously in abundance on the plains and only requires thinning (Murrill, Journ. New York Bot. Gdn. x. 1909, p. 36).

The wood for use as a dye is stated to be cut after the trees are 10 years old (Bentley & Trimen, Med. Pl. No. 86).

The plant makes a substantial hedge. It is well established at Oloke Meji, and in 1906 a large quantity of plants were being raised from seeds grown there (Thompson, Col. Rep. Misc. No. 51, 1908, p. 47). A tree at Old Calabar was bearing seeds in 1897, being then about 5 years old.

Ref.—"Campechy or Logwood," Calvert in Journ. Soc. Arts, xix. 1871, pp. 815–816.——"Logwood," Jarmain, l.c. xxiv. 1876, pp. 985–987.——"Lignum Haematoxyli," in Pharmacographia, Flückiger & Hanbury, pp. 213–216.——"Note on the Pharmacy of Logwood," Siebold, in Year Book of Pharmacy, 1887, pp. 548–555.——"Note on the application of Dyewoods in Chemical Analysis," Siebold, l.c. pp. 555–556.——"Bois de Campèche," in Les Drogues Simples, Planchon & Collin, ii. pp. 485–487 (Octave Doin, Paris, 1896).——"Logwood," in Bull. Bot. Dept. Jamaica, iii. 1896, pp. 179–183.——"How to gather Logwood Seed," Sharp, l.c. iv. 1897, p. 152.——"Sowing Logwood Seed," MacMahon, in Queensland Agric. Journ. ii. 1898, pp. 37–38.——"Bastard Logwood," in Bull. Bot. Dept. Jamaica, viii. 1901, pp. 1–2.——"Bastard Logwood, Earle, in Journ. New York Bot. Garden, iv. 1903, pp. 3–4; reprint in Bull. Dept. Agric. Jamaica, i. 1903, pp. 30–31; West Indian Bull. iv. 1903, p. 3.——"Logwood Root Rot," l.c. p. 2.——"Blauholz," in Die Rohstoffe des Pflanzenreiches, Wiesner, ii. pp. 930–932.——"Chemical Notes on Bastard Logwood," Gruenberg & Gies, in Bull. Torrey Bot. Club, xxxi. 1904, pp. 367–377; reprint in Bull. Dept. Agric. Jamaica, ii. 1904, pp. 241–250; West Indian Bull. v. 1904, pp. 249–258; Abstract in Nature, lxxi. 1905, p. 222; Journ. Soc. Arts, liii. 1905, pp. 193–194; Pharm. Journ. [4] xx. 1905, p. 37.——"Logwood," in Timbers of Commerce, Stone, pp. 68–69.——"Haematoxylon—Logwood" in the National Standard Dispensatory, Hare, Caspari and Rusby, p. 755.——"Bastard Logwood from Jamaica," Drabble & Nierenstein, in Journ. Inst. Comm. Research in the Tropics, Liverpool Univ. ii. April, 1907, pp. 38–40; Reprint in Bull. Dept. Agric. Jamaica, v. 1907, pp. 185–187.

CASSIA, Linn.

Cassia Absus, *Linn.*; Fl. Trop. Afr. II. p. 279.

Ill.—Buchoz, Herb. Col. Ameriq. t. 56; Jacq. Eclogae Pl. Rar. t. 53; Nees von Esenbeck, Pl. Medic. Düsseld. t. 350; Burman, Thes. Zeyl. t. 97 (*Senna quadrifolia*, etc.).

Vernac. names.—Fidele (Nupe, *Barter*); Fiddeli (Katagum, *Dalziel*); Chickm (Arabia, Egypt, *Moloney*); Tschischiva or Tscheschun (Congo, *De Wildeman*); Chimed [Seeds] (Mozambique, Mus. Kew).—Black Grain.

Quorra; Nupe; Katagum. Common in Tropical Asia, extending to Australia, and throughout the Tropics.

The seeds are used as a foment in ophthalmia by the natives in Nupe (Barter, Herb. Kew), for the same purpose and as a cathartic in India (Watt, Comm. Prod. India, p. 287), in Egypt and the Sudan (Guillem. Perr. Rich. Fl. Senegamb. i. p. 262), and has also been used in the treatment of ophthalmia with satisfactory results by Dr. Harbauer in Brussels (De Wildeman, Pl. Util. Congo, Art. xiv. 1903, p. 165). A preparation of the seed is used for the cure of dyspepsia, headache, and for other medicinal purposes (l.c.).

Ref.—"*Cassia Absus*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp .210–211.——"*Cassia Absus*," in Pl. Utile du Congo, De Wildeman, Art. xiv.: "Les Cassia du Congo," pp. 165–166 (Spineux & Co. Brussels, 1903).

Cassia acutifolia, *Delile*; Fl. Trop. Afr. II. p. 278.

Ill.—Delile, Egypte, t. 27, f. 1; Colladon, Hist. Cass. t. 15c (*C. lanceolata*); Hayne, Darst. Beschr. Gewäche, ix. t. 40 and t. 41 (*C. lanceolata*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 345 (*C. lanceolata*); Steph. & Ch. Med. Bot. t. 30 (*C. senna*); Berg & Schmidt, Darst. Beschr. Pharm. i. t. 8 f. (*C. lenitiva*); Batka, Monogr. Senna t. 1 (*Senna acutifolia*); Baillon, Hist. Pl. ii. f. 99 (leaf), f. 100 (pod); Bentl. & Trimen, Med. Pl. t. 90; Köhler, Med. Pflan. i; Engl. & Prantl, Pflan. iii. pt. 3, f. 89 E–G; Freeman & Chandler, World's Comm. Prod. p. 338 (leaves).

Vernac. name.—Senna jebeli (Arabic, *Flückiger & Hanbury*).—Alexandrian Senna; Aden Senna; Nubian Senna.

The dried leaves are largely imported in bales from Alexandria for medicinal purposes. It is the best of all the "Sennas" (Mus. Kew). The value on the London Market at the present time is 5*d.* to 5½*d.* per lb. (Chem. & Druggist, Aug. 27th 1910, p. 60).

Found in Nubia from the Sea Coast to between 3000 and 4000 ft. (Bent, Herb. Kew), and in the Hadramaut at an altitude of 1700 ft. (Lunt, Herb. Kew).

The other important Sennas of commerce are "Arabian," "Mocha," "Tinnivelly," "Bombay," or "East Indian" Senna (*C. angustifolia*, Vahl.), Fl. Trop. Afr. ii. p. 279, and "American Senna" (*C. marilandica, L.*).

Ref.—"On the Plants from which Senna-Leaves are obtained," Batka, in Pharm. Journ. [1] ix. 1850, pp. 25–31.——"Folia Sennae," in Pharmacographia, Flückiger & Hanbury, pp. 216–221 (Macmillan & Co. London, 1879).——"*Cassia acutifolia*," in Med. Pl. Bentley & Trimen, No. 90, 6 pages (J. & A. Churchill, London, 1880).——"Senna Leaves," Holmes, in Pharm. Journ. [4] x. 1900, pp. 226–227.

Cassia alata, *Linn.*; Fl. Trop. Afr. II. p. 275.

Ill.—Rumpf, Amb. vii. t. 18; Jacq. Obs. t. 45, f. 2 (*C. herpetica*); Rchb. Mag. Bot. t. 84; Desc. Ant. vi. t. 443; Blanco, Fl. Filip. t. 124; Wight, Ic. Pl. Ind. Or. i. t. 253; Ralph, Ic. Carp. t. 18, f. 2; Christy New Comm. Pl. & Drugs, No. 11, 1889, p. 36; Greshoff, Nutt. Ind. Pl. t. 12; Pobéguin, Fl. Guin. Franç. tt. 48 and 58.

Vernac. names.—Nga-Hire (Ivory Coast, *De Wildeman*); Dadmarden [=ringworm killer (India, *Watt*)].——Ringworm shrub.

Abeokuta. Widely spread in the tropics of both hemispheres.

The leaves rubbed up into a thin paste and mixed with vaseline are an effective remedy for ringworm (Watt, Comm. Prod. India, p. 287), or the parts affected may be rubbed with the leaves moistened with water or an acetic extract of the leaves may be used (Year Book Pharm. 1887, p. 175). The leaves are purgative, used as senna, and said by Hindoo doctors to cure all poisonous bites (Moloney, For. W. Afr. p. 331; Dymock, Veg. Mat. Med. p. 217.) On the Ivory Coast the fresh leaves are bruised and used to cure skin disease (Heckel, Pharm. Journ. [4] xi. 1900, p. 439).

Ref.—"Treatment of Ringworm by leaves of *Cassia alata*," Foulis, in Pharm. Journ. [3], vii. 1877, p. 618.——"*Cassia alata*," in Dict. Econ. Prod. India, Watt. ii. 1889, pp. 211–212."——"*Cassia alata*," Amades, in New Comm. Pl. & Drugs, Christy, No. 11, pp. 36–37 (Christy & Co., London, 1889).——"*Cassia alata*," in Nuttige Indische Planten, Greshoff, pp. 43–45 (J. H. De Bussy, Amsterdam, 1894).——"*Cassia alata*," in Les Pl. Utile du Congo, De Wildeman, Art. xiv. 1903: "Les Cassia du Congo," pp. 166–167.

Cassia Fistula, *Linn.* Sp. Pl. (1753) p. 377.

A middle-sized erect tree, glabrous in all its parts. Leaves a foot or more long; leaflets 8–16, large, 2–6 in. long, ovate, distinctly stalked, usually acute, rigidly subcoriaceous, pale green, strongly veined. Flowers in lax racemes, a foot or so long; pedicels spreading, $1\frac{1}{2}$–2 in. long; calyx $\frac{1}{4}$–$\frac{1}{3}$ in., glabrous, caducous. Petals obovate, shortly clawed, $\frac{3}{4}$–1 in. long, bright yellow, veined. Pod 1–2 ft. long, terete, about an inch in diameter. Seeds compressed, parallel with the dissepiments (Fl. Br. India, ii. p. 261).

Ill.—Commelin, Hort. Med. Amstel. i. t. 110; Rheede, Hort. Mal. i. t. 22 (*Conna*); Gaertner, Fruct. Sem. Pl. ii. t. 147; Lam. Encycl. t. 332 (pods); Plenck Ic. iv. t. 327; Buchoz, Herb. Col. Ameriq. t. 89; Desc. Ant. ii. t. 125; Hayne, Darst. Beschr. Gewäche, ix. t. 39; Tuss. Ant. iv. t. 2; Nees von Esenbeck, Plant. Medic. Düsseld. t. 344 (*Cathartocarpus Fistula*); Woodville, Med. Bot. iii. t. 160; Steph. & Ch. Med. Bot. t. 155; Wight, Ic. Pl. Ind. or. i. t. 269 (*C. rhombifolia*); Burnett, Pl. Util. ii. t. 55b; Baillon, Hist. Pl. ii. f. 103 (fl. and fr. branch), f. 104 (pod), f. 105 (pod, long. section); Bentl. & Trimen, Med. Pl. t. 87; Vidal, Fl. For. Filip. t. 42 E (pod); Good, Fam. Flor. ii. t. 77.

Vernac. names.—Caña fistula (Guam, Philippines, Mexico, *Safford*); Cañapistola (Philippines, *Safford*); Amaltash or Amaltas (India, Mus. Kew); Gnooshway, Ngu (Burma, Mus. Kew); Tanggoeli (Java, *Treub*).—Golden Shower; Pudding Pipe Tree; Indian Laburnum; Purging Fistula; Purging Cassia.

Native of India, Ceylon, Java, Philippines, &c., and widely distributed in the Tropics, including Tropical Africa.

The pulp of the fruit is a safe and useful purgative and is one of the commonest of domestic remedies in India (Watt, Comm. Prod. India, p. 287). It is in common domestic use in the South of Europe, but not often used in England except in the form of the Lenitive Electuary (Confectio Sennae) of which it is an ingredient (Flückiger & Hanbury, Pharmacog. p. 223). The flowers are said to have lenitive, and the root powerfully purgative properties (Mus. Kew).

The bark is used to some extent as a tanning material in India (Watt, l.c.) and for dyeing and tanning in Java (Treub, Mus. Kew).

The wood is very durable, used for posts, agricultural implements (Manson, Mus. Kew), carts and rice pounders, in India, though rarely of sufficiently large size for timber; weighs 52 to 73 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 272). It has been recommended for paving blocks, the price quoted (1900) being 1000 francs per 100 sq. metres [7750 blocks] at Rangoon (Mus. Kew).

May be propagated by seed, and the tree is very suitable for decorative purposes.

Ref.—"*Cassia Fistula*," in the Family Flora and Mat. Med. Bot. Good, ii. No. 77, 4 pages (Cambridge, Mass. 1854).——"Fructus Cassiae Fistulae," in Pharmacographia, Flückiger & Hanbury, pp. 221-224.——"*Cassia Fistula*" in Med. Pl. Bentley & Trimen, ii. No. 87, 4 pages.——"*Cassia Fistula*," in Dict. Econ. Prod. India, Watt, 1889, pp. 217-219.——"*Cassia Fistula*," in Man. Ind. Timb. Gamble, pp. 271-272.

Cassia mimosoides, *Linn.*; Fl. Trop. Afr. II. p. 280.

Ill.—Bot. Mag. t. 5874 (var. *Telfairiana*); Collett, Fl. Simla, p. 148.

Vernac. names.—Kalefemise (Lagos, *Millen*); Fugindi ? (Congo, *Burton*); Kōto cha, Nemucha, or Ichinen-cha (Japan, *Safford*); Teturian (Java, Tropenpfl. 1902, p. 427).——Tea Senna.

Lagos; Nupe; Zungeru; Kontagora.

The young stem and leaves are dried as a substitute for tea in Japan (Safford, Pl. Guam, p. 218), and in Lagos (Millen, Herb. Kew); as fodder for horses and cattle in Java (Tropenpfl. 1902, p. 427). The roots are used to cure colic (De Wildeman, Pl. Util. Congo, Art. xiv. 1903, p. 173).

The tree is common in sandy soils, Nupe (Barter, Herb. Kew); common everywhere in Zaria, Kontagora, &c. (Dalziel, l.c.).

Cassia obovata, *Collad.*; Fl. Trop. Afr. II. p. 277.

Ill.—Colladon, Hist. Cass. t. 15A; Hayne, Darst. Beschr. Gewäche, ix. t. 42, t. 43 (*C. obtusata*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 347; Guimpel, Abbild. Beschr. iii. t. 206; Wight, Madras Journ. vi. t. 5 (*C. Burmanni*); Schnizlein, Ic. iv. t. 275b. f. 2; Wight, Ic. Pl. Ind. Or. t. 757 (*C. obtusa*); Ralph, Ic. Carp. t. 18, f. 7; Berg & Schmidt, Darst. and Beschr. Pharm. ii. t. 9b; Batka, Monogr. Senna, t. 3 (*Senna obovata*); Baillon, Hist. Pl. ii. f. 97 (fr. branch); Bentl. & Trimen, Med. Pl. t. 89; Zippel, Ausl. Handels. Nährpfl. t. 28.

Vernac. names.—Filasko (Katagum, *Dalziel*); Senna (Arabic, *Muriel*, [Kordofan]); Bezr senna mukkee (Baghdad, *Hyslop*); Senna baladi (Arabic, *Flückiger & Hanbury*).——Senegal, Tripoli, Italian, Spanish, Jamaica, or Country Senna.

Bure, between Kuka and Lake Chad; Katagum. Common throughout the Soudan.

Yields some of the Senna leaves of commerce, but the leaves of this species are not now official in the British Pharmacopoeia. Occasionally seen in the Indian bazaars as an inferior quality of Senna (Watt, Comm. Prod. India, p. 288).

The leaves are gathered at Khartoum in March when the tree is in full pod. Grows abundantly in this region on the sand-covered fields (Grant, Trans. Linn. Soc. xxix. 1872, p. 64).

Ref.—" Monograph der Cassien Grappe Senna," Batka, pp. 1–52, pls. 1–5 (1866).——" *Cassia obovata*," in " Med. Pl. Bentley & Trimen," ii. No. 89.——" Spurious Alexandrian Senna," Greenish, in Pharm. Journ. [4] ix. 1899, pp. 470–471.

Cassia occidentalis, *Linn.* ; Fl. Trop. Afr. II. p. 274.

Ill.—Bot. Reg. (1815) t. 83 ; Desc. Ant. ii. t. 135 ; Velloso, Fl. Flum. iv. t. 66 ; Ralph, Ic. Carp. t. 18, f. 3 ; Rev. Hort. 1897, p. 156.

Vernac. names.—Rere (Lagos, *Dawodu*) ; Rere (W. Africa, *Abayomi Cole*) ; Abo-Rere (?) (S. Nigeria, *Foster*) ; Fedigosa or Fedogose (Tette, Zambesi, *Livingstone*, *Moloney*) ; [Fedegoso (Ambriz) ; Bantamare (Senegal) ; Munhanoca (Loanda), Căffé (Golungo Alto) *De Wildeman*] ; Senna mekké (Arabic, *Muriel*) ; [Mumutum sable (Guam) ; Balatongaso (Philippines) ; Frijolillo (Panama) ; Hierba hedionda (Cuba) ; Hedionda (Porto Rico) *Safford*] ; Semillo de Platanillo (Cuba, *Schutte*).——Coffee Senna ; Negro Coffee ; Wild Coffee ; Café Marron ; Café nègre ; Styptic Weed ; The Stinking Weed ; Small Senna.

Lagos : N. Bornu ; Ikure (Cross River). Widely distributed in Tropical Africa and throughout the tropics generally.

The seeds are used in Tropical Africa—Ebo, Port. E. Africa (Stocks, Mus. Kew), Tette (Livingstone, Mus. Kew), Gambia (Mus. Kew), &c. ; Central America, West Indies—Cuba, (Schutte, Mus. Kew), &c. as a substitute for Coffee.

All parts of the plant are used for various medicinal purposes. An infusion of the leaves is used as a specific for black-water-fever in Lagos (Punch, Herb. Kew) ; as a purgative in Lagos and in Liberia (Dawodu, Herb. Kew ; Holmes, Pharm. Journ. [3] viii. p. 564) ; ground and mixed with palm-oil as a remedy for convulsions, in ophthalmia &c. (Cole, Journ. Soc. Arts, 1905, p. 1069) ; in the treatment of certain fevers in Dahomey (De Wildeman, Pl. Trop. Grande Cult p. 73) ; useful in cases of yellow fever, and Europeans find a draught of the infusion of the leaves in the early morning an excellent preventive of sick headache (Heckel Pharm. Journ. [4] xi. 1900, p. 439). The root is very bitter—used with good results in intermittent fevers (Hiern, Cat. Welw. Afr. Pl. i. p. 193) ; as a specific for gonorrhœa, black-water-fever and malarial dysentery (Cole l.c.) ; and an infusion (one part root to 45 parts boiling water) as a tonic and diuretic in dropsy and liver complaints (Christy, New Comm. Pl. & Drugs, No. 8, 1885, p. 40).

The seeds are sometimes imported into Europe (Jackson, Comm. Bot. Nineteenth Cent. p. 55).

The plant is easily raised from seed, and appears to grow freely everywhere.

Ref.—" *Cassia occidentalis* and Negro Coffee," in Pharm. Journ. [3] vi. 1876, p. 909.——Negro Coffee," in Kew Report, 1881, pp. 34–35.——" Sur le M'bentamaré ou Fedégosa (*Cassia occidentalis*) " : Étude de botanique de matière medicale et de therapeutique, Heckel, in Archives de Medicine Navale 1887.——" *Cassia occidentalis*," in Dict. Econ. Prod. India, Watt, ii. 1899, pp. 221–223.——

"*Cassia occidentalis*" in Pl. Utile du Congo, De Wildeman, Art. xiv : " Les Cassia du Congo," pp. 169-172, with analysis of seed from Year Book Pharm. 1876, p. 179.

Cassia Sieberiana, *DC.* ; Fl. Trop. Afr. II. p. 270.

Vernac names.—Aridan toro (Oloke Meji, *Foster*) ; Gamafada (Katagum, *Dalziel*) ; Bagamma (Kontagora, *Dalziel*) ; Efo (Lagos, *MacGregor*) ; Guamgua (Gambia, *Ozanne*) ; Bongbo (Sierra Leone, *Scott Elliot*) ; Bangbi (Sierra Leone, *Unwin*) ; Mossambe, Mósua (E. Congo, *Welwitsch*).——African Lilac.

Lagos ; Ibadan ; Abeokuta ; Nupe ; Katagum ; Kontagora ; and widely distributed in West Africa.

An infusion of the root is used as a diuretic on the Gambia (Kew Bull. 1893, p. 371). The pods are used as a fish poison in Kano (Dalziel, Herb. Kew), and in native medicine, Sierra Leone (Col. Rep. Ann. No. 656, 1910, p. 37) ; they are met with in all the markets of the coast (Angola), used by the native medical men to divine disease but not to cure it (Hiern, Cat. Welw. Afr. Pl. i. p. 290).

May be propagated by seeds. The flowers are very handsome, and the tree is worth growing for decorative purposes. Barter compares the beauty of a tree at Agbenia Egbe with that of *Amherstia nobilis* (Herb. Kew).

Ref.—" *Cassia Sieberiana*," in Les Veg. Utilés de L'Afrique, Trop. Franç. Chevalier, Perrot & Gérard, Fasc. iii. pp. 85–88.

Cassia Sophera, *Linn.* ; Fl. Trop. Afr. II. p. 274.

Ill.—Rheede, Hort. Mal. ii. t. 52 ; Rumpf, Amb. v. t. 97 ; Jacq. Ic. Pl. Rar. i. t. 71 (*C. ruscifolia*) ; Sweet, Fl. Austral. t. 32 (*C. Barclayana*) ; Bot. Reg. (1824) t. 856 (*C. purpurea*) ; Burman, Thes. Zeylan. t. 98 (*Senna ugnitifolia*) : Bisch. in Bot. Zeit. 1850, t. 10 (*C. lanceolata*, Forsk.).

Vernac name.—Amot-tumaga (Guam, *Safford*).

Niger. India, extending to Australia, and cosmopolitan in the tropics.

The bark, leaves and seeds are cathartic, and the juice of the leaves a specific for ringworn (Watt, Comm. Prod. India, p. 288) ; the bruised leaves and bark of the root, powdered and mixed with honey are applied externally in ringworm and ulcers (Safford, Pl. Guam, p. 219).

An infusion of the bark is used as a remedy for diabetes (l.c.), also the powdered seeds for the same purpose (Moloney, For. W. Afr. p. 331).

Ref.—" *Cassia Sophera*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 223–224.

Cassia Tora, *Linn.* ; Trop. Afr. II. p. 275.

Ill.—Rheede, Hort. Mal. ii. t. 53 ; Ralph, Ic. Carp. t. 18, f. 4.

Vernac. names.—Tafassa (Katagum, *Dalziel*) ; Opa iku (Lagos, *Dawodu*) ; Ako-rere (S. Nigeria, *Foster*) ; Doré (Gambia, *Whiteley*, *Moloney*, Sierra Leone, *Scott Elliot*) ; Chakramarda [ringworm destroyer] (India, *Watt*) ; Mumutun adamelon or Mumutun palaoan (Guam, *Safford*).——Foetid Cassia ; Metal Seed ; Fantupa Seed.

Katagum ; Nupe ; Lokoja ; Lagos. Widely distributed in Tropical Africa, and the tropics generally.

The seeds are regularly sold to dyers for use with indigo ; roasted and ground as a substitute for coffee (Watt. Comm. Prod. India,

p. 288), as a substitute for Coffee, Ibo, Port. E. Africa (Stocks, Mus. Kew), and to allay irritable eruptions (Moloney, For. W. Afr. p. 331). The leaves are aperient, used as a remedy for ulcers and ring-worm, and together with the stalks are eaten on the Gambia as food (l.c.); fried in castor oil they are applied to ulcers (Safford, Pl. Guam, p. 219). The root rubbed with lime juice is a remedy for ring-worm (l.c.).

Ref.—"Cassia Tora," in Dict. Econ. Prod. India, Watt ii. 1889, pp. 224–226.——"Cassia Tora," in Pl. Utile du Congo, De Wildeman. Art. xiv.: "Les Cassia du Congo," pp. 173–174 (Brussels 1903).

DIALIUM, Linn.

Dialium guineense, *Willd.*; Fl. Trop. Afr. II. p. 283.

Ill.—Roemer, Archiv. Bot. i. t. 6; Guillem. Perr. Rich. Fl. Senegamb. t. 58 (*D. nitidum*); Engl. & Drude, Veg. Erde, ix. p. 634, f. 542; Harms, in Notizbl. App. xxi. No. 2, 1911, p. 58.

Vernac. names.—Awin (Lagos, *MacGregor*, *Thompson*, *Dawodu*); Ohiorme (Benin, *Unwin*); Ogwega (?) (S. Nigeria, Bull. Imp. Inst. 1908, p. 150); Kocyto (Mandingue, *Moloney*, Sierra Leone, *Scott Elliot*); Mawkai (Sierra Leone, *Scott Elliot*); Solum (Yoloff, *Moloney*, Sierra Leone, *Scott Elliot*); Moké (French Guinea, *Farmar*); Salamba (St. Thomas, *Welwitsch*).——Velvet Tamarind: Black Tamarind; Tumble Tree of Sierra Leone.

Lagos; Ogba; Abeokuta; Onitsha, and widely distributed in West Africa.

The fruit is edible (Johnson, Herb. Kew); pulp pleasantly acid and commonly eaten (Moloney, For. W. Afr. p. 332).

The wood is described as strong, excellent for carpentry and suitable for small boats, &c. (Moloney, l.c.).

Found on the Gold Coast in the mixed deciduous forests where the rainfall is below 50 inches a year (Thompson, Col. Rep. Misc. No. 66, 1910, p. 16), and in the mountainous forests at about 2000 ft. above sea-level at Monte Caffé, Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 294).

CERATONIA, Linn.

Ceratonia Siliqua, *Linn.* Sp. Pl. (1753) p. 1026.

A tree 15–25 ft. high. Branches few, or developing into a well-formed, hemispherical head. Leaves pinnate; leaflets 4–8, oval, dark-green and shining above, paler on the under surface, coriaceous. Flowers dioecious, arranged in slender racemes up to 10 in. long, bearing usually 30–60, sometimes more flowers (*Gennadius*), red before expansion, greenish afterwards. Pods 6–10 in. long, chestnut-brown, sweet, edible, containing 12–18 hard, reddish-brown seeds.

Ill.—Plenck, Ic. viii. t. 735; Cav. Ic. ii. t. 113; Gaertner, Fruct. Sem. Pl. ii. t. 146; Lam. Encycl. t. 859; Andr. Rep. ix. t. 567; Tratt. Arch. t. 103; Duhamel, Traite des Arbres, i. t. 58; Hayne, Darst. Beschr. Gewäche, vii. t. 36; Risso, Hist. Nat. Prod. Europe Merid. ii. t. 2; Nees von Esenbeck, Plant. Medic. Düsseld. t. 341; Guimpel, Abbild. Beschr. t. 103; Gallesio, Pomona, Ital. vi. t. 14 (female fl. br.), t. 15 (male fl. br.); Sauvaigo, Les Cult. Medit. f. 94; Rchb. Ic. Fl. Germ. t. 2054, ff. 1–12, t. 2076, ff. 1–5; Karst. & Schenck, Veg. bild. vii. t. 24 (habit).

Vernac. names.—Paloura (Cyprus, *Gennadius*) ; Algaroba (Spanish, *Gennadius*).——Carob Bean ; Locust Bean ; St. John's Bread.

Native of S. Europe and the Mediterranean region. Wild and cultivated in N. Africa ; naturalised in certain parts of India ; cultivated in the West Indies, &c.

The beans are an important food for stock—cattle, horses and pigs. Crushed and mixed with coarse fodder they are a very palatable and nourishing ration (Kearney *&* Means, U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 80, 1905, p. 85). In Naples horses are given for their daily food 6 kilog. of broken carobs, 6 kilog. of bran and 10 kilog. of hay (Gennadius, The Carob Tree, p. 10) ; it is usual to break the pod into two or three pieces, and to put it in the nose-bag or manger mixed with bran (Cons. Rep. Misc. No. 431, p. 6). In this country they are used in the preparation of concentrated cattle-foods (Kew Bull. Sept. 1887, p. 18).

In Cyprus a kind of molasses and sugar candy called "pasteli" is obtained from the beans—about 8 okes (22⅖ lbs.) of molasses, and 6 okes (16⅘ lbs.) of pasteli are obtained from 15 okes (42 lbs.) of carobs. About 18 to 25 per cent. of spirit may also be distilled from them. The "sherbets" of the Turks, Arabs, and Fellahs are prepared from these beans and liquorice. Fried carobs are often used in Spain to adulterate coffee and chocolate (Gennadius, l.c. p. 12).

"Black Honey" made from the pods is exhibited in the Kew Museum.

The seed when treated yields a powerful gum, which is used for industrial purposes (Cons. Rep. Ann. No. 3935, 1907, p. 11), probably by calico printers and finishers who have recently devoted some attention to the bean as a thickening agent (Queensland Agric. Journ. xxiii. 1909, p. 132 ; from Indian Trade Journ. 22 April).

The heartwood is easily worked, polishes well and can be used for making carts and furniture. It does not withstand much moisture, though its density is 0·827 to 0·908 (Gennadius, l.c. p. 13), equal to 51 lbs. per cubic foot (*see also* Gamble, Man. Ind. Timb. p. 278).

The kotted branches are imported into this country for making walking-sticks (Mus. Kew).

Propagated by seed, which is very hard, and may require soaking before sowing. It is advisable to grow the seedlings on in pots (bamboo for preference), as the plants do not transplant well from nursery beds, owing to the development of a tap root. They should be large enough to put out in permanent places, about 20 feet apart, in less than twelve months, and in about one to two years later should be ready for grafting—an operation necessary to ensure good crops, the tree being dioecious. The best results are obtained by grafting scions of improved races upon seedling trees. The Spanish practice is to graft a branch from a male tree on the base of a female tree (Kearney & Means, l.c. p. 84). Male trees may have each branch grafted from a female tree, reserving one ungrafted male branch to ensure fertilisation (Kew Bull. 1898, p. 184).

In Cyprus the young trees are budded when about 7 feet high (Gennadius, The Carob Tree, p. 17).

The two best varieties in Italy are both called "Honeybag"—one with a long narrow pod, the other a short wide one (Neville-Rolfe, in Cons. Rep. Misc. No. 431, 1897, p. 5).

A dry, well drained, stony or calcareous soil ; a warm climate—

like that suitable for the orange or warmer—and light rainfall are necessary conditions of growth.

Various estimates of the time the trees begin to bear and the yield are given—comes into bearing at 3 years in Queensland (Newport, Queensland Agric. Journ. 1904, p. 359) ; begin to bear fairly well after 6 years, and in 15 or 20 years are in full production, yielding 650 lbs. of pods each tree at this age in Algeria (Kearney & Means, l.c. p. 85) ; about 8 years old, a single tree yielding about 2 cwt. of pods (Kew Bull. 1898, p. 184) ; trees 18 years old in Salerno yield about 50 chilos (about 120 lb.) annually (Neville-Rolfe, l.c.), and in Cyprus commences to bear fruit usually in the third year from the time of grafting, yielding then 10 to 15 okes (28 to 42 lbs.) and when full grown the crop is about 50 okes (140 lbs.) of pods annually (Gennadius, l.c. p. 20).

The price of pods of good quality varies from £3 12*s.* to £4 per ton, but fruit from wild trees averages below £2 16*s.* per ton (Cons. Rep. Ann. No. 3935, 1907, p. 11).

Ref.—"*Ceratonia Siliqua*," in Dict. Econ. Prod. India, Watt. ii. 1889, pp. 254–256.——"Sur le Caroubier et sur son fruit," Heckel, in Repertoire de Pharm. Dec. 1892.——"Caroubier," in Les Cultures sur le littoral de la Méditerranée, Sauvaigo, pp. 215–218 (Ballière et Fils, Paris 1894).——Report on the Cultivation of the Carob Tree, Neville-Rolfe, Dip. and Cons. Rep. Misc. No. 431, 1897, pp. 1–6 ; reprinted in Kew Bull. 1898, pp. 184–189.——The Carob Tree, Gennadius, pp. 1–30 (Govt. Printing Office, Nicosia, Cyprus, 1902).

BAUHINIA, Linn.

Bauhinia reticulata, *DC.* ; Fl. Trop. Afr. II. p. 290.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 60 ; Ralph, Ic. Carp. t. 15, f. 3 ; Karst. & Schenck, Veg. bild. iv. t. 10 ; Sim, For. Fl. and For. Res. Port. E. Afr. t. 43.

Vernac. names.—Kalgo (Katagum, Kontagora, *Dalziel*) ; Kalgo or Kargo (Zaria, *Parsons*) ; Kargo (Hausa, *Dudgeon*) ; Abaffi (Yoruba, *Thompson*) ; Otokobakar (Gold Coast, *Evans*) ; Mugali (Banyoro, Uganda, *Dawe*) ; Ngingwi (Sierra Leone, *Scott Elliot*) ; Guiguisa (Gambia, *Whitely*) ; Nguiguis or Guiguis (W. Africa, *Moloney*) ; M'Keendambogo, Keeteembee (Unyoro, *Grant*) ; Mulôlo (Angola, *Welwitsch*) ; Mulolo or Musacamia (Golungo Alto, *Welwitsch*) ; Lokokendamba (Lakufu, *De Wildeman*) ; Tambarib or Harub (Arabic [Kordofan], *Muriel*) ; Abou Kamera (Arabic [Abou Shendi, Blue Nile], *Muriel*); Masikesi (Swahili, *Sim*) ; Niama (Fr. W. Afr. *Chevalier*).

Oloke-Meji ; Abeokuta ; Nupe ; Zungeru ; Katagum ; N. Bornu—banks of Komadugu Waube. Widely distributed in Tropical Africa.

An infusion of the leaves has been used with good effect to coagulate the latex of *Funtumia elastica* on the Gold Coast (Evans, Mus. Kew ; Cat. Exhibits Gold Coast, Franco-British Exhib. 1908, p. 11), and to coagulate the latex of *Landolphia* in French W. Africa (Chevalier, Les Veg. Util. L'Afriq. Trop. Franç. fasc. iii. p. 76). The leaves in Unyoro are used for covering sores (Grant, Trans. Linn. Soc. xxix. 1872, p. 65) ; near Abou Shendi, on the Blue Nile, boiled in water as a remedy for toothache (Muriel, Herb. Kew), and in Angola they are crushed and applied to wounds and ulcers (Hiern Cat. Welw. Afr. Pl. i. p. 193).

The bark yields a tough fibre (Fl. Trop. Afr. l.c.) used in Unyoro for ropes (Grant, l.c.), in French West Africa (Chevalier, l.c.), in Senegal (Moloney, For. W. Afr. p. 333), on the Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 91), and in S. Nigeria (Thompson, Rep. on Tour through Meko and Shaki Districts, No. 25 of 1910, p. 7). It is used in decoction to cleanse ulcers in Angola; occasionally cultivated near Loanda for this purpose, and generally employed in Angola as an astringent decoction in cases of intermittent fever and eruptions (Hiern, l.c. pp. 296–7); sometimes used in native medicine in Uganda (Dawe, Rep. Bot. Misc. Uganda, 1906, p. 26).

From the roots a mahogany-coloured pigment is obtained, used by the Banyoro for staining wooden utensils; the stain is most effective, and if applied slightly diluted, it dries rapidly and with a good gloss (l.c.). The seeds when burnt produce a black dye (Moloney, l.c.; Whitely, Mus. Kew).

The small branches are used by the Sudanese as tooth brush sticks (Chevalier, l.c. p. 77), and a similar use is attributed to the plant in Kontagora, (Dalziel, Bull. Imp. Inst. 1907, p. 258).

In French West Africa the young growing points are eaten by cows, sheep, and goats (Chevalier, l.c. p. 76).

The stem is usually crooked and gnarled and the timber though good is seldom of a useful size, (Sim, For. Fl. & For. Res. Port. E. Afr. p. 48). The wood is not unlike mahogany in colour, very suitable for furniture, and makes beautiful picture frames; the weight is about 45 lbs. per cubic foot (l.c. p. 118). Chevalier (l.c. p. 79) gives the density as 0·707 [=44 lbs. per cubic ft.], and states that it is frequently used for cabinet-work, joinery, carpentry, cartwrights-work, canoes, mortars, and pestles. De Wildeman (Pl. Util. Congo, Art. xxvi. 1904, p. 365) attributes somewhat similar uses to the wood.

The tree is universally distributed over the dry zone (Thompson, Col. Rep. Misc. l.c.); met with principally in the neighbourhood of creeks and very common as underwood (Chevalier, l.c. p. 73).

Ref.—"*Bauhinia reticulata*," in Les Veg. Utiles de L'Afrique Trop. Franç. Chevalier, Perrot et Gérard, fasc. iii. pp. 72–77, with illustrations of microscopical sections of the wood—transverse and longitudinal, and summarising the information in a tabular statement at end of volume (Challamel, Paris, 1907).

Bauhinia rufescens, *Lam.*; Fl. Trop. Afr. II. p. 289.

Ill.—Lam. Encycl. t. 329, f. 2; Fielding & Gardner, Sert. Pl. t. 10 (*B. parvifolia*).

Vernac. names.—Matsagge (Katagum, *Dalziel*); Kulkul (Arabic, *Muriel* [Kordofan, near Bara]); Bei (W. Africa, *Moloney*); Randa or Rand, Namare or Namari, Sifilé or Sifili (F. W. Africa, *Chevalier*).

Abeokuta; Borgu; Bornu; Katagum; and throughout W. Africa.

Wood used in carpentry (Moloney, For. W. Afr. p. 332; Cat. Prod. Col. Fr. Exhib. Universale 1867, p. 44); the density is given at 0·713 or 44·5 lbs. per cubic foot.

The natives of French West Africa use the bark for making ropes, tanning leather, and as a remedy for small-pox, dysentery and leprosy; the root in intermittent fever, and a decoction of the leaves in diseases of the eye (Chevalier).

Ref.——*Bauhinia rufescens*, in Les Veg. Utiles de L'Afrique Trop. Franç. Chevalier, Perrot & Gérard, Fasc. iii. pp. 77–79.

Bauhinia tomentosa, *Linn.*; Fl. Trop. Afr. II. p. 290.

Ill.—Rheede, Hort. Mal. i.t. 35; Burman, Thes. Zeylan. t. 18*; Bot. Mag. t. 5560 (var. *glabra*); Wood, Natal Pl. iv. t. 399.

Vernac. names.—[Ati (Khandeish, India), Petan or Petang (Ceylon) Mus. Kew].—St. Thomas Tree.

Native of Ceylon and India. The stem yields a fibre used locally in India and Ceylon, for making cord and rope (Mus. Kew).

The dried leaves and flower buds are used by Native Indian Doctors in dysenteric affections; a decoction of the bark and root is used in liver and phlegmatic complaints also as a vermifuge, and bruised is occasionally applied to tumours and wounds (Moloney, For. W. Afr. p. 332; Watt, Dict. Econ. Prod. India).

The wood is dark, heavy and tough, heartwood nearly black.

Commonly cultivated in the Tropics as a decorative plant. It was introduced to Kew in 1860 from Benguella, Angola, and flowered in 1866 (Bot. Mag. t. 5560). McNair reports the cultivation of this plant at the Botanic Station, Ebute Metta in 1889 (Rep. for Quarter ending June 30, 1889, Lagos Bot. St.).

Bauhinia variegata, *Linn.* Sp. Pl. (1753) p. 375.

A small tree; branchlets slender, glabrous except at the tips, which with the peduncles and buds are grey with a fine pubescence. Leaves orbicular, 3–4 in. in diameter, bifid, 9–11 nerved, lobes rounded, sinus acute with a mucro; petiole 1–2 in. long, slender. Flowers in short racemes, 4 in. in diameter. Calyx spathaceous, tube as long as the limb. Petals clawed, obovate-oblong, obtuse, delicately veined, rose-coloured, rose variegated with crimson, cream colour and purple, or white, variegated with yellowish-green, the lower more cuneate, streaked with crimson. Stamens 5, three longer than the others, erect. Ovary slender, hairy, stipes and style slender. Pod 1–2 ft. long, $\frac{3}{4}$–$1\frac{1}{4}$ ft. broad, flat, curved, stipitate, acute or acuminate, septate within. Seeds broadly oblong, much compressed (Bot. Mag. t. 6818).

Ill.—Rheede, Hort. Mal. i. t. 32 (Chovanna-Mandaru); Cattley, Ic. Pl. Chin. t. 26 (*B. chinensis*); Bot. Mag. t. 6818; t. 7312 (var. *candida*).

Native of the E. Indies; Burma, and China.

The leaves are made into cigarette covers in India (Watt, Comm. Prod. India, p. 122), and also used as a vegetable, as are the flower buds which are often pickled (Bot. Mag. t. 6818). The young pods are also used in India as a vegetable, and almost every part of the plant is used there in native medicine—the bark, flowers and root triturated in rice water used as a cataplasm, a decoction of the root in dyspepsia, the flowers taken with sugar as a laxative, and the bark as a tonic and anthelmintic (Watt, l.c. pp. 121, 122).

The bark is alterative, tonic and astringent (Mus. Kew), and is employed for dyeing and tanning (Bot. Mag. l.c.).

The tree yields the gum known as Sem or Semla gónd with the properties of Cherry gum (Dict. Econ. Prod. India).

The wood is used for making agricultural implements in India. It weighs 33–48 lbs. per cubic foot. (Gamble, Man. Ind. Timb. p. 284).

The plant is of value for decorative purposes, and it is being propagated and distributed from the various Botanic Stations in S. Nigeria. McNair reports that it was well established and in flower at Ebute Metta in 1888 (Rep. Bot. St. Lagos, Quarter ending Dec. 31st, 1888).

Ref.—"*Bauhinia variegata,*" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 425–426.

Other Bauhinias being established in the various Botanic Gardens are *B. diphylla*, Hamilt., an Indian plant (McNair, Rep. Bot. St. Lagos, 1888), *B. Megalandra*, Griseb.; flowered and fruited Bot. St. Lagos, 1888 (McNair), propagated for distribution as an ornamental plant by the Agricultural Dept. W. Province, S. Nigeria (S. Nigeria Govt. Gaz.: Price List of Plants, 1910), and *B. purpurea*, Linn.——seeds sent from Kew to Lagos in 1889; bark used for dyeing and tanning, and yielding a fibre; leaves used as fodder for cattle; various medicinal uses attributed to the bark, flowers and root, and the wood (40–45 lbs. per cubic foot) used for agricultural implements and for building purposes (Mus. Kew).

Ref.—"*Bauhinia,*" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 419–426.——Comm. Prod. India, Watt, pp. 120–122.

BERLINIA, Solander.

Berlinia acuminata, *Solander*; Fl. Trop. Afr. II. p. 293.

Ill.—Baillon, Adansonia, vi. t. 3, f. 10 (flower).

Var. **Heudelotiana,** *Baillon*, Fl. Trop. Afr. II. p. 294.

Ill.—Baillon, Adansonia, vi. t. 3, ff. 8–9.

Vernac. names.—Ajia (Onitsha, *Unwin*); Ekpogoi, Ekpogaije, Ekpagoy, or Ekpgoi (Benin, *Thompson*, *Dennett*, *Unwin*); Apado (Yoruba, Oloke-Meji, *Thompson*, *Foster*); Dokan rafi (Hausa, *Dudgeon*); Mpossa (Loango, *De Wildeman*); Sô, or Sau (various localities, French West Africa, *Chevalier*).

Lagos, Yoruba—Oloke-Meji; Ilorin; Onitsha; Old Calabar; Cross River; Zungeru. Widely distributed in W. Trop. Africa.

The wood of "Ekpagoy" is described as hard and white, light red, or streaked, slightly ornamental, useful in the Colony, but of no value for export. (Bull. Imp. Inst. 1908, p. 152); 55·6 lbs. per cubic foot (l.c. p. 147, q.v. for results of general mechanical tests of a specimen from S. Nigeria).

Wood used for carpentry, cabinet work and turnery (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 369), and by the natives of the Congo region for canoes and drums (l.c. p. 339, as *Berlinia acuminata*). The natives of French Guinea use it for furniture, timber-work and pillars; and it is in general, recommended for cabinet-work, wheelwright-work, naval construction, &c. The density is given as 0·649 (Chevalier, Les. Veg. Util. L'Afriq. Trop. Franç. iii. p. 81, as *Berlinia acuminata*.

Ref.—"*Berlinia acuminata,*" Les. Veg. Utiles de L'Afrique, Trop. Franç. Chevalier, Perrot & Gérard, Fasc. iii. pp. 80–82. With a summary of the information in tabular form at end of volume.

B. Heudelotiana is a very variable plant and all the references quoted above may perhaps be better referred to it, rather than to *B. acuminata*.

ISOBERLINIA, Craib & Stapf.

Allied to *Berlinia*, Sol., but differing from that genus in its longer panicles, smaller subsessile flowers with short receptacle, and petals subequal in length and not or but slightly exceeding the sepals.

Receptacle short. Sepals 5. Petals 5, not or only slightly exceeding the sepals, subequal in length, the posterior generally slightly broader than the others, sessile or subsessile but never long clawed. Stamens 10, all fertile, free, exserted; anthers oblong, uniform. Ovary stipitate, stipe adnate to the receptacle posticously, ovules 6; style elongate, filiform, stigma small, terminal. Pod woody, compressed; seeds rotundate, compressed. Unarmed trees. Leaves abruptly pinnate, leaflets rigidly chartaceous to coriaceous. Flowers medium-sized, in spiciformed racemes arranged in terminal panicles. Bracts small, deciduous; bracteoles large, concave, enclosing the bud, persistent until after flowering.

Isoberlinia Dalzielii, *Craib & Stapf* in Kew Bull. 1912, ined.

Leaves equally pinnate; leaflets 6–8, ovate to oblong, apex slightly emarginate, rounded or truncate at the base, $2\frac{1}{2}$–6 in. long, $1\frac{1}{2}$–$3\frac{1}{2}$ in. broad, tomentose in the young state, mature glabrous above, velvety beneath, firmly chartaceous, main nerves 8–10 on each side, prominent below; petiolules short. Panicle 1 ft. long; rachis and branches ferrugineo-tomentellous; bracts ovate, acute, caducous; bracteoles tomentellous on both surfaces. Calyx lobes 5, narrow subequal. Petals 5, subequal in length. Stamens 10, filaments pilose towards the base. Ovary densely hairy.

Vernac. names.—Farin-doka (Kontagora, *Dalziel*); Ferin-doka? (Hausa, *Dudgeon*).

Kontagora (Dalziel, No. 26, 1906, Herb. Kew); ? Zaria (Dudgeon, No. 8, 1909, Herb. Kew).

Bark used with *Strophanthus hispidus*, and other plants in arrow-poison, Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 265—under *Berlinia paniculata*).

Food plant of the Tsamian fakali silkworm (Dudgeon, N. Nigeria, Govt. Gaz. July 31st, 1909, p. 160—under *Macrolobium* sp. ?).

Isoberlinia Doka, *Craib & Stapf* in Kew Bull. 1912, ined.

Glabrous excepting flowers and young branches of inflorescence. Leaves equally pinnate; leaflets 6, ovate-elliptic, acute or slightly acuminate at the apex, cuneate at the base—the terminal pair unequally so—3–7 in. long, $1\frac{3}{4}$–$3\frac{3}{4}$ in. broad, firmly chartaceous, main nerves 8–10 on each side, prominent below, distinctly petioluled. Panicle terminal, $4\frac{1}{2}$–9 in. long; bracts broadly ovate, acute, deciduous; bracteoles rather densely pilulose on both surfaces. Calyx tube evident, lobes 5, subequal. Petals 5. Stamens 10, filaments shortly and sparingly pilose towards the base. Ovary densely hairy.

Vernac names.—Doka (Katagum, *Dalziel*); Bokin-doka ? (Zaria, *Dudgeon*); Doka ? (Zaria, *Parsons*).

Katagum (Dalziel, No. 364, 1908, Herb. Kew); ? Zaria (Dudgeon, No. 9, 1909, Herb. Kew).

"Bokin-doka" is the food plant of the "Tsamian doka"? silkworm (*Anaphe Moloneyi*) (Dudgeon, N. Nigeria Govt. Gaz. July 31st, 1909, p. 160—under *Macrolobium Palisoti* ?).

"Doka" supplies most of the forked supports for native houses in Zaria (Parsons, N. Nigeria Govt. Gaz. Feb. 28th, 1910, p. 102—under *Berlinia acuminata*).

MACROLOBIUM, Schreb.

Macrolobium Palisoti, *Benth.*; Fl. Trop. Afr. II. p. 297.

Ill.—Pal. de Beauv. Fl. Ow. Ben. i. t. 42 (*Anthonotha macrophylla*); Baillon, Adansonia, vi. t. 3, ff, 6, 7 (Flower &c. *Vouapa macrophylla*).

Vernac. names.—Ogaba (Benin, *Thompson*, *Unwin*); Furuduga ? (Sierra Leone, *Smythe*).

Benin ; Obeyon near Etoi River ; confluence of Quorra (Niger) and Tchadda (Benue).

Wood, hard and red (Thompson, Col. Rep. Misc. No. 66, 1910, p. 21).

Samples of gum from this species are exhibited in the Museum, Kew, sent by the Royal Niger Co. in 1887.

The tree occurs in the freshwater swamp forests of Southern Nigeria and the Gold Coast.

DANIELLIA, Bennett.

From time to time various specimens of resin-yielding trees have been received at Kew from W. Africa, and in some cases the specimens have been accompanied by samples of the resin. It has been found that several new species of *Daniellia* are represented, and though it appears probable that they may all yield valuable resins, the question is at present somewhat uncertain. One of the principal and best-known sources of the ogea resin of commerce appears to be the *Daniellia thurifera* of the Flora of Tropical Africa which has now been referred to the new genus *Paradaniellia*.

Daniellia caudata, *Craib* in Kew Bull. 1912, ined.

Pinnae with 5 (?) pairs of leaflets. Leaflets oblong, caudate—acuminate, obtuse, broadly cuneate at the base, about 4½ in. long, 1¾ in. broad, both surfaces glabrous, main nerves numerous, parallel, straight and almost at right angles to mid-rib, slightly raised on both surfaces ; petiolules 5 lin. long, channelled above, glabrous.

Vernac. name.—Ogia (Benin, *Unwin*).

Agogidigbo, Cent. Prov. S. Nigeria (Unwin, No. 179, 1907, Herb. Kew).

Daniellia Fosteri, *Craib* in Kew Bull. 1912, ined.

Leaflets in 7–9 pairs, oblong or oblong-lanceolate, acuminate, acute or mucronulate, obliquely rounded at the base, 2¼–6¼ in. long, ¾–2 in. broad, main nerves about 10 pairs, conspicuous above, prominent beneath, as are the nervules, glabrous on both surfaces, conspicuously pellucid ; petiolules 4 lin. long.

Vernac. name.—Oguja (Jebu Ode, *Millson*).

Mamu Reserve (Foster, No. 156, 1906, Herb. Kew) ; Jebu Ode, W. Prov. S. Nigeria (Millson, No. 37, 1890, Herb. Kew).

Yields a resin, described as "of third quality" (Millson, Mus. Kew).

Daniellia oblonga, *Oliv.* ; Fl. Trop. Africa. II. p. 300.

Fernando Po (Mann, No. 166, Herb. Kew. *See also* Oliver in Hook. Ic. Pl. t. 2406 in nota).

A large tree, 150–200 ft. high, but timber soft and of no value except for canoe making (Mann l.c.).

Daniellia Ogea, *Rolfe.* [*Cyanothyrsus Ogea*, Harms, in Engl. Bot. Jahrb. xxvi. 1889, p. 270.]

A large tree, Leaflets lanceolate or oblong-lanceolate, acuminate mucronate, base cuneate, glabrous, subcoriaceous, main nerves 6–7 on each side, conspicuous on both surfaces, interarching well within margin, up to 3¼ in. long, 1 in. broad ; petiolules 2½ lin. long, pedicels barely ½ in. long, shortly ferrugineous pubescent, calyx lobes 4 exterior rotundate, 4 lin. diameter, interior broadly elliptic, 5½ lin. long, 2½ lin. broad ; normal petals 3, oblong orbicular, reduced petals 2, minute, lanceolate, filaments densely pubescent in the lower half. Pod oblong falcate, compressed, 2½ in. long, 1¼ in. broad. Seed solitary, attached by a long funicle, laterally near the apex of the pod.

Ill.—Thompson, Col. Rep. Misc. No. 66, 1910, t. 15 (*Cyanothyrsus Ogea*).

Vernac. names.—Ogea (Lagos *Millen*) ; Ahedua or Ehyedua ? (Twi, Gold Coast, *Thompson*, l.c. p. 196) ; Asiadua ? (Gold Coast ; *Thompson*).

Lagos (Millen, No. 191, Herb. Kew).

Furnishes Ogea Copal from Ijebu, Lagos ; plentiful in the interior (Millen l.c.).

Daniellia Punchii, *Craib* in Kew Bull. 1912, ined.

Large tree. Branchlets and leaf rachis straw-coloured. Leaflets elliptic-oblong, acuminate, obliquely rounded at the base, 5–5½ in. long, 2¼ to almost 2½ in. broad, glabrous on both surfaces, main nerves about 7 on each side, conspicuous above, prominent beneath ; petiolule short. Branches of inflorescence rufo-tomentellous.

Resembling *D. oblonga* in flowers, but leaflets much larger.

Vernac. name.—Ujia (Ibadan, *Punch*).

Ibadan Forest Reserve (Punch, No. 115, Herb. Kew).

Yields a resin, the native name signifying "large tree yielding resin" (l.c.).

Daniellia similis, *Craib* in Kew Bull. 1912, ined.

All parts, except the inflorescence, glabrous. Leaflets in 8 pairs, oblong or oblong-lanceolate, acuminate, obliquely and broadly cuneate at the base, 2¼–4 in. long, ¾–1¼ in. broad, glabrous on both surfaces, shining above, main nerves numerous sub-prominent on both surfaces. Branches of inflorescence tomentellous.

Readily distinguished from *D. Ogea* by its more numerous nerves which are not so prominent.

Represented in the Kew Herbarium by a specimen from the Gold Coast only (Dudgeon, No. 5 ; communicated by the Imperial Institute, March, 1909).

Vernac. names.—Ogea (Gold Coast, *Dudgeon*).—Gold Coast Gum Copal tree.

The "Gum Copal" of the Gold Coast is described as a purely forest product found chiefly in Ashanti—an exudation from wounds on the stems, roots, and branches of aged trees, which on exposure becomes hard and brittle, and when buried in the soil for a long time semi-fossilised (Ann. Rep. Agric. Gold Coast, 1909 (for 1908) p. 11).

The exports were valued in 1906 at £2216, and in 1907 at £5134 ; in 1908 it was valued at 51*s.* 6*d.* to 71*s.* 4*d.* per cwt. (Col. Rep. Misc. No. 63, 1909, p. 171, under Gold Coast or Accra Copal, *Cyanothyrsus Ogea*).

The flowers of *D. caudata*, *D. Fosteri*, *D. Punchii*, and *D. similis* are similar in detail of structure to those of *D. Ogea* and *D. oblonga*.

Daniellia thurifera, *Benn. non Oliver.*

Leaflets about 7 pairs, oblong, acuminate, obliquely cuneate to truncate at the base, 4¼ to 8 in. long, 3 in. broad, chartaceous glabrous, main nerves numerous, conspicuous on both surfaces, petiolules

4 lin. long. Inflorescence unknown. Pod oblong, falcate, 2¾ in. long, 1½ in. broad. Seed solitary, attached by a long funicle laterally near top of pod.

Vernac. names.—Ogea (Lagos, *Moloney*) ; Bungo (Sierra Leone, *Daniell*) ; Bumbo, Bungbo, or Bungo (Sierra Leone, *Bennett*).——Frankincense of Sierra Leone.

Lagos (Moloney, Herb. Kew, 1883).

Daniellia sp.

Readily distinguishable by its leaf rachis and midrib, pubescent beneath.

Vernac. names.—[Ogea (Yoruba); Ujea (Popo, Lagos) *Moloney.*]

Lagos (Moloney, 1883, Herb. Kew).

Daniellia sp.

Probably distinct, but represented in the Kew Herbarium by flowering material only.

Yields the gum copal, W. Province, S. Nigeria (Thompson, No. 18, 1906, Herb. Kew).

PARADANIELLIA, Rolfe.

Paradaniellia Oliveri, *Rolfe.*

[*Daniellia thurifera*, Oliv. Fl. Trop. Afr. II. p. 300, *non* Bennett.]

Ill.—Hook. Ic. Pl. t. 2406 (*D. thurifera*) ; Volkens, in Notizblatt, App. xxii. No. 3, 1910, p. 92, f. 45 (*D. thurifera*) ; Engl. and Drude, Veg. Erde, ix. p. 801, f. 674 (*D. thurifera*, after Hooker).

Vernac. names.—Dunchi (Lokoja, *Elliott*) ; Ozia, or Oyiz (Ishan, S. Nigeria, *Dennett*) ; Ozaba (Ibo, *Unwin*) ; Osia (Benin, *Unwin*) ; Iya (Oloke Meji, *Foster*).

Lagos, Oloke Meji (Foster, No. 151, 1907, Herb. Kew) ; Asaba (Unwin, No. 23, 1906, Herb. Kew) ; Ugboha, Ishan (Dennett, No. 102, 1907, Herb. Kew) ; Kontagora (Dalziel, No. 16, 1905, Dudgeon No. 62, Herb. Kew) ; Lokoja (Elliott, No. 14, Herb. Kew) ; Nupe (Barter, No. 978, Herb. Kew).

According to Thompson, the " Balsam Copaiba tree " or " Iya " of the Yorubas is very abundant in the open country, especially at the sources of the Oha river and along the banks of the Upper Ofiki river. The wood is durable and the natural regeneration of the tree prolific. (Tour through Meko and Shaki Districts, No. 25, 1910, S. Nigeria, p. 7.)

This tree yields a balsam, and the wood shows an excellent grain, which in small manufactured articles closely resembles that of mahogany ; it is commonly 50 to 60 feet high, frequently unbranched to a considerable distance from the ground, and is perhaps the commonest large tree in the district [Kontagora] (Dalziel, Bull. Imp. Inst. 1907, p. 256, under *Daniellia thurifera*).

Source of wood oil and copal (Dudgeon, No. 62, Herb. Kew), of wood oil " Balsam of Copaivi " very common especially near Lokoja (Elliott No. 14, Herb. Kew), and the natives collect a gum like copal from this tree. Nupe (Barter, No. 978, Herb. Kew).

The botanical identity of the " resins " or " copals " of W. Africa has been subject to much uncertainty. They are attributed to various species of *Daniellia* and *Copaifera* (*q.v.*).

The vernacular names given above have been correlated from specimens in the herbarium at Kew, and the following names and general particulars may also belong to one or other of the species of *Daniellia* as well as of *Paradaniellia* mentioned.

"Abo-Ogea," described as yielding an abundant supply of a comparatively soft extract when freshly cut; common in the Ilesa forests and throughout Ekitiland, where it is said to be used for stopping leakages in pots, &c. (Leigh & Dawodu, Encl. in No. 66, Acting-Governor Sir G. Denton, Lagos, 28th June, 1898, to Sec. of State for the Colonies, Bot. Ent. in W. Africa, p. 63, as *Daniellia thurifera* ?).

"Ako-Ogea," "a hard fossilised gum used largely in varnish making," and "medicinally by the Natives"; found plentifully in Benin and Idoko forests, and in certain parts of Yorubaland in swampy localities; formerly exported from Lagos, collected chiefly in Ondo, Aiyeson, Itebu, &c. (l.c. *Daniellia sp.*). Similar specimens from Yorubaland were exhibited at the Linnean Society in 1883; used by the natives, according to Sir A. Moloney, for fire and light, and powdered, as a body perfume by the women; exuded from insect borings in the tree, and also dug out from swampy ground (Thiselton-Dyer, Journ. Linn. Soc. xx. 1884, p. 408; *Daniellia sp.*; see also Hillier, Kew Bull. 1906, p. 199, *Daniellia thurifera*, Benn.).

"Bu" or "Boo," from Golo, Sudan; wood 52½ lbs. per cubic foot, of no value for export (Bull. Imp. Inst. vii. 1909, p. 22, under *Daniellia thurifera*).

"Bubalinabo," of the Gambia, yields a resin from wounds in the trees generally where the trunk forks; collected and sold in Bathurst for use in Roman Catholic churches as well as in native houses. The resin is dried in the sun, powdered finely, and the woody portions removed before being used. A decoction of the root and bark is used as a medicinal draught for gonorrhœa and skin diseases ("Craw-craw"), and the wood is used for making mortars in which grain, &c. is pounded (Dudgeon, Gambia Govt. Gaz. March 6th, 1909, p. 128, under *Daniellia thurifera*).

"Iya Odan," Lagos (Thompson, Col. Rep. Misc. No. 51, 1908, p. 84, *Daniellia thurifera*).

"Kadaura" (Hausa), "Katlahi" (Fufulde), "Karon Maje" (Hausa), Yola Province, N. Nigeria—extract used, either alone or in combination with others (*Boswellia Dalzielii* and *B. odorata*), as frankincense, to fumigate clothing and houses (Dalziel, Kew Bull. 1910, p. 137, under *Daniellia thurifera*).

"Maji" (Hausa)—African balsam of copaiva; extracted by fire; used for preparing paste rubber and medicinally (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 160, *Daniellia thurifera*).

"Santang," Gambia (see Bubalinabo"); Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 58, *Daniellia thurifera*).

"Thievi," Senegambia (Moloney, For. W. Afr. p. 333, *Daniellia thurifera*); Sierra Leone (Heckel, Ann. Inst. Col. Marseille, vi. 1899, p. 127. *D. thurifera*).

"Wood Oil," "Ilorin Balsam," or "African Balsam of Copaiva" is also attributed to *Daniellia* (see Pharm. Journ. [3] xxii. 1891, p. 449; Col. Rep. Ann. No. 656, 1910, Rep. on Work of the Imp. Inst. 1909, p. 36, *Daniellia thurifera*; Thompson, Rep. Tour in Meko and Shaki No. 25, 1910, S. Nigeria, p. 7, *D. thurifera*; Col. Rep. Misc. 66, 1910, p. 88, *D. thurifera*; l.c. Ann. No. 512, 1906, p. 23; l.c. Ann. No. 554, 1908, p. 39; l.c. Misc. No. 51, 1908, p. 39; l.c. Ann. No. 633, 1910, p. 25).

The inferior sorts of "Gum Copal" are usually obtained from living trees, and the superior or so-called "semi-fossilised" are dug from the ground as a residue from dead trees, or hardened by long exposure after exuding from living trees.

The chief use in this country is for making varnish, and the most desirable product for this purpose is hard (melting point 120° C.–200° C.), clear (glassy fracture) and uniform in colour (pale or white) and size (from a pebble to a small boulder).

The price may vary from 30*s.* to 60*s.* per cwt. and may be as much as 140*s.* per cwt. according to quality. In 1890 "Ogea Gum" from Lagos realized 2½*d.* per lb.—about 24*s.* per cwt. (Kew Bull. 1891, p. 207), and in 1908, "Nigerian Copal" was worth about 35*s.* per cwt. (Col. Rep. Misc. No. 63, 1909, p. 177). The export began in 1885, gradually increasing from 1430 lb. in 1886; 1841 lb. in 1887; 48,905 lb. in 1888; 110,766 lb. in 1889 (Kew Bull. l.c.). In 1909 the export of "Gum Copal" from S. Nigeria was 48,061 lb., value £706 (Col. Rep. Ann. No. 665, 1911 (for 1909), p. 12).

"Accra" or "Gold Coast Copal" was valued in 1909 at 51*s.* 6*d.* to 71*s.* 4*d.* per cwt. (Col. Rep. Misc. No. 63, 1909, p. 171).

Analyses and special details of the various extracts from these trees are given in the following references:—

Ref.—"Description of the Bungo, or Frankincense Tree of Sierra Leone," Bennett in Pharm. Journ. [1] xiv. 1855, pp. 251–253.——"On the Frankincense tree of Western Africa," Daniell, in Pharm. Journ. [1] xiv. 1855, pp. 400–403.——"Ogea Gum," Thiselton-Dyer, in Journ. Linn. Soc. xx. 1884, pp. 408–409.——"Frankincense Tree of Sierra Leone, Thievi of Senegambia, Bumbo, Bungo or Bungbo (*Daniellia thurifera*)," in For. W. Africa, Moloney, pp. 333–334.——"African Copaiba so-called," Umney, in Pharm. Journ. [3], xxii. 1891, pp. 449–450; Oleo-resin from the Niger Company, offered in London as Balsam Copaiba.——"Ogea Gum (*Daniellia* and *Cyanothyrsus spp.*)," Hillier, in Kew Bull. 1906, pp. 199–200.——"*Daniellia thurifera*," in Les Végétaux Utiles de L'Afrique Tropicale Française, Chevalier, Perrot & Gérard, Fasc. iii. pp. 90–94 (Challamel, Paris, 1907).——"Copal from Southern Nigeria," in Bull. Imp. Inst. vi. 1908, pp. 249–250, with analysis——"Resin of *Daniellia thurifera* from Northern Nigeria," l.c. pp. 250–252, with analysis.——"Copal Resin from the Gold Coast," in Col. Rep. Misc. No. 63, 1909, pp. 171–175.——"Copal from Southern Nigeria," l.c. pp. 176–177.——"Resin of *Daniellia thurifera* from Northern Nigeria and the Gambia," l.c. pp. 177–179.——"Detection of African Copaiba," Tusting Cocking, in the Chemist and Druggist, lxxvii. 1910, p. 51.——"Accra Copal," in Pharm. Journ. [4] xxxii. 1911, p. 65.

AFZELIA, Smith.

Afzelia africana, *Smith*; Fl. Trop. Afr. II. p. 302.

Ill.—Guillem. Perr. Rich, Fl. Senegamb. t. 57; Prain, Scient. Mem. Med. Off. India (1901) t. 12; Tropenpfl. Beib. 1906, p. 257 (habit); Thompson, Col. Rep. Misc. No. 66, 1910, t. 14; Engler & Drude, Veg. Erde, ix. t. 42 (habit), f. 673; Harms in Notizbl. App. xxi. No. 2, 1911, p. 53.

Vernac. names.—Kawo (Katagum, *Dalziel*); Arachi (Cent. and W. Prov. S. Nigeria, *Thompson*); Apa (Lagos, Yoruba, *Thompson*); Apa (Oloke Meji, *Foster*); Adja (Cent. Prov. S. Nigeria, *Thompson*); Aligna (Benin, *Thompson*); Opapao (Aquapim, Gold Coast, *Thompson*); Papao-Baum (Togo, Tropenpfl. 1906, p. 257); Baa (Acholi, Uganda, *Dawe*).—African Mahogany.

Lagos; Oloke Meji; Mamu Forests; Nupe, and widely distributed in tropical Africa.

A useful tree for timber and shade.

The wood is hard and durable. It is frequently exported to Europe under the general trade name of African Mahogany; largely used in the Central Province, S. Nigeria, for making furniture (Thompson, Col. Rep. Misc. No. 66, 1910, p. 88); used for building purposes (l.c. No. 51, 1908, p. 25); for doors and mortars and by the Railway Company in S. Nigeria (Thompson, List of For. Trees, S. Nig. p. 6); used for cabinet work, turnery and naval construction on the Congo (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 378).

In Senegal the seed is used as a charm by the Natives, and the arillus is said to be eaten by them and also by monkeys; the burnt pods give a fine ash rich in potash, used in the manufacture of a native soap (De Wildeman, Pl. Util. Congo, ii. 1906, Art. i. p. 110).

This tree reproduces itself freely from seed. It is generally found in the open country on the Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 88) and the watersheds in the Western Province, S. Nigeria; excellent forests are found from the junction of the Oha river with the Oyan to the town of Meko, especially on the highest portion of the main plateau; along the plateau to the S.E. of Jubata, and in the Shaki District, in certain parts of which the trees are finely developed, and the bulk of the timber appears to be figured and of great value (Thompson, Rep. Meko and Shaki District, 1910, p. 6); found as a large tree in Nupe (Barter Herb. Kew). Full grown trees of "Kawo" are decorative features in towns and villages in Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 256, under *A. quanzensis*).

Afzelia bracteata, *Vogel*; Fl. Trop. Afr. II. p. 301.

Ill.—Hook. Ic. Pl. tt. 790, 791; Hook. Niger Fl. tt. 34, 35; Prain, Scient. Mem. Med. Off. India (1901) t. 12.

Vernac. name.—Ekpogoze (Benin, *Unwin*).

Owan river, Cent. Province, S. Nigeria.

Afzelia cuanzensis, *Welw.*; Fl. Trop. Afr. II. p. 302.

Ill.—Sim, For. Fl. and For. Res. Port. E. Afr. t. 45.

Vernac. names.—Mwande (Barotzeland, *Cockerell*) Hlafuta or Chaputa [(Ironga [Lorenzo Marques] Swazi); Iachenu, Insena, Sina or Xina (Shengaan, M'Chopes, &c.); Musacosse or Momba periwede (Echuabo); Mugoberere (Swahili) *Sim*]; Mahogoni boom (Dutch [Transvaal] *MacOwan*).——Mahogany; Rhodesian Mahogany.

Tropical Africa.

Wood of fine surface, inclined to be brown in the centre or pinkish brown in old logs suitable for quartering, planking, boxes, &c., though subject to borers; weight 40 to 45 lbs. per cubic foot (Sim l.c. pp. 115, 121).

The seeds are used in this country for ornamental purposes—hat-pins, necklaces, &c. (Mus. Kew).

There are no specimens in the Kew Herbarium from Nigeria; though the tree has been found in Angola. It may be worth cultivating for its valuable timber.

BRACHYSTEGIA, Benth.

Brachystegia spicaeformis, *Benth.*; Fl. Trop. Afr. II. p. 306.

Ill.—Sim, For. Fl. and For. Res. Port. E. Afr. t. 42 ; Engler and Drude, Veg. Erde, ix. p. 425, f. 364 ; p. 600, f. 519 (habit).

Vernac. names.—Ako (Yoruba, *Thompson*) ; Okwen (Benin, *Thompson*) ; Ille Pagini (Sierra Leone, *Unwin*) ; Mupondo (Angola, *De Wildeman*) ; Panda, Mupanda, or Mupondo (Huilla, *Welwitsch*) ; Umpanda, Mapondo, Npanda (Congo, *De Wildeman*) ; M'chenga, or M'nenga (Cent. Afr. *Grant*) ; M'chenga (Mlanje Plateau, *Purves*) ; [Tzontzo (Gaza) ; M'tamba (Inhambane) ; Marotta (Quelimane) ; Macarara (Swahili) *Sim*] ; Pao Ferro=Iron wood (Port. E. Afr. *Sim*).

Oshun River Reserve.

The bark is used in S. Nigeria for making a coarse native cloth (Thompson, Col. Rep. Misc. No. 51, 1908, p. 4), in Zanzibar for kilts, cloths, band-boxes, grain stores, matches, roofing for camp huts, &c. (Kew Bull. 1892, p. 59), in Zambesia and Port. E. Africa it is the principal sacking material used largely for making bags to convey earth-nuts to the coast, for mealie meal, cassava flour, and various other articles of trade, drums for storing grain, &c., ropes, water-buckets, cradles, beehives, coffins, &c. (Sim, For. Fl. and For. Res. Port. E. Afr. pp. 49, 142).

"Cloth" is also made from the inner bark by the natives of the Mlanje Plateau (Purves, Herb. Kew).

The preparation of the bark-cloth is simple and similar to that for *Adansonia digitata*, p. 86 (*q. v.*) ; though the bark of *Brachystegia* remains somewhat rigid after beating, and to make it soft and pliable the women of Port. E. Africa chew the beaten sheets throughout ; for certain purposes—grain drums, water buckets, &c., in parts of Southern Zambesia the bark is neither beaten nor chewed (Sim, For. Fl. and For. Res. Port. E. Afr. p. 142).

The wood is very hard and heavy (Thompson. l.c.). Used in construction on the Congo (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 370) ; in all domestic and woodwork construction, Port. E. Africa (Sim, l.c. p. 49).

The natural regeneration of the tree is said to be prolific (Thompson, l.c. p. 12) ; it occurs in the freshwater Swamp Forests of S. Nigeria (l.c. p. 55), and is the most characteristic feature of the forests bordering the Oshun river (l.c. p. 4). It is found in the Robeho Mts., Zanzibar, at an altitude of 4700 ft. (Grant, Trans. Linn. Soc. xxix. p. 66), and as a small branching tree 15 to 20 ft. on the Mlanje Plateau at an altitude of 6000 feet (Purves, Herb. Kew).

Ref.—"Bark Cloth of Uganda," in Kew Bull. 1892, pp. 58–60.——"*Brachystegia spicaeformis*," in Forest Flora and Forest Resources, Port. E. Africa, Sim, pp. 49 and 141–142 (Taylor & Henderson, Aberdeen, 1909).

It is not unlikely that all the *Brachystegias* have a bark similar to that described, and that other species occur in Nigeria.

The bark of *Brachystegia tamarindoides*, Welw. ; Fl. Trop. Afr. ii. p. 307, is used in Port. E. Africa for all the purposes stated under *B. spicaeformis* (Sim, l.c.), and in Central Africa (5° to 10° S. 32° E.) the bark after being boiled and prepared is made into white sheets or cloths worn by the natives ; it is used for roofing huts and making canoes, boxes, matches, and ropes (Grant, Trans. Linn. Soc. xxix. 1872, p. 66).

Brachystegia appendiculata, Benth. ; Fl. Trop. Afr. ii. p. 305, the "Motondo" of the Batoka Country, Zambesi (Kirk, Kew Bull. 1892,

p. 59); *B. longifolia*, Benth.; the "Nangwesu," "Njombo" or "Mjombo," of the Nyasaland Protectorate (Buchanan, Kew Bull. 1892, p. 59; Purves, Herb. Kew), and *B. Woodiana*, Harms, are all described as possessing a fibrous bark from which a "cloth" is obtained.

TAMARINDUS, Linn.

Tamarindus indica, *Linn.*; Fl. Trop. Afr. II. p. 308.

Ill.—Rheede, Hort. Mal. i. t. 23; Rumpf, Amb. ii. t. 23; Bergius, Mat. Med. Reg. Veg. i. p. 34; Plenck, Ic. i. t. 31; Jacq. Icon. Select. Stirp. Am. t. 10; Lam. Encycl. t. 25, f. 1; Desc. Ant. ii. t. 126; Tuss. Ant. iii. t. 35; Hayne, Darst. Beschr. Gewäche, x. t. 41; Nees von Esenbeck, Plant. Medic. Düsseld. t. 343; Wagner, Pharm. Med. Bot. t. 41; Guimpel, Abbild. Beschr. t. 44; Woodville, Med. Bot. iii. t. 161; Steph. & Ch. Med. Bot. t. 88; Burnett, Pl. Util. i. t. 12A; Cassone, Fl. Medico-Farmaceutica ii. t. 114; Ralph, Ic. Carp. t. 19, f. 1; Bot. Mag. t. 4563 (*T. officinalis*); Lemaire, le Jard. Fl. ii. 1852, t. 133; Berg & Schmidt, Darst. Beschr. Pharm. ii. t. 9c.; Bedd. Fl. Sylv. t. 184; Baillon, Hist. Pl. ii. ff. 73–76; Bentl. & Trimen, Med. Pl. t. 92; Vidal, Fl. For. Filip. t. 43D (pod); Köhler, Med. Pflan. ii.; Engl. & Prantl, Pflan. iii. pt. 3, f. 79; Tschirch, Ind. Heil. Nutzpfl. tt. 49, 50 (Tamarindenallee); Shattuck, Bahama Is. t. 33 (habit); Contr. U.S. Nat. Herb. ix. t. 66; Karst. & Schenck, Veg. bild. vi. t. 40; Sim, For. Fl. and For. Res. Port. E. Afr. t. 47; Engl. & Drude, Veg. Erde, ix. f. 66.

Vernac. names.—Ajagbon (Yoruba, *Thompson*); Tsamia (Kontagora, *Dalziel*); Tsamia (Hausa, *Dudgeon*); Madilo or Kily (Madagascar, *Baron*); Bwemba (Nyasaland. *Purves*); Looquajoo (Usagara, *Grant*); [Kamalindo (Guam), Sampalok, Sambalagui, Sambag, Sambagui, Tamarindo (Philippines) *Safford*]; Tamr hindee (Arabic, *Hooker*); [Tamarindeiro (Port.) Egansela Umqwembe or Mamieba (Quelimane) *Sim*]; Dakhar; D'Kar; Diammi; Diané; Kharallé, Tombi; Tomi; Boscogna, Kared; Kara; Tombigui (F. W. Afr. various parts, *Chevalier*).——Tamarind; Indian Tamarind; Indian Date.

Native of the East and West Indies. Cultivated in India, Burmah, Tropical Africa, &c.

The pulp of the fruit is well known for its medicinal properties—used as a laxative for which purpose it is imported from India and the West Indies. For export the pulpy portion is in India pressed together, usually without sugar. Egyptian Tamarinds are made into cakes and dried in the sun, and the West Indian product is prepared with syrup. In India as well as for medicinal purposes, it is used in curries, chutnies and sauces (Hooper, Agric. Ledg. No. 2, 1907, p. 13). In Northern Nigeria a beverage is made by steeping the pods in water, generally mixed with onions (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 160); and in F. W. Africa the pulp is used to coagulate rubber latex (Chevalier, Les. Veg. Util. L'Afriq. Trop. Franç. iii. p. 130). Tamarinds are given in Burmah as a tonic to working elephants.

In 1909, 3250 cwts., value £2302, of Tamarinds were imported into England [including 77 cwts., value £63. from Foreign Countries, and 3173 cwts., value £2239 from B. W. India Islands] (Trade of the United Kingdom, i. 1910, p. 227).

Fair Antigua Tamarinds sold (Nov. 1910) in bond (London) at 10*s.* 6*d.* per cwt. (Agric. News, Barbados, 1910, p. 15), and at the present time (Feb. 1911) the value in London is about 10*s.* per cwt. for W. Indian, and 12*s.* 6*d.* per cwt. for E. Indian.

The kernels are eaten in India in times of scarcity, and occasionally at ordinary times; powdered and boiled in a small quantity of water the seeds make a tenacious glue or size used by wool weavers, saddlers and book-binders (Hooper, l.c. p. 15).

The leaves are the food of the "Tsamian tsamia" silkworm in N. Nigeria. In Bauchi the worms pupate in the hollow trees; the cocoons are collected and boiled in water which has been filtered through wood ashes. White or brown silk of worms fed on this tree is described as the best quality; price for 7 lbs. of cocoons at Diwoti being £1 (Dudgeon, l.c. pp. 161, 162).

The wood is very hard and heavy—61–80 lbs. per cubic foot; used in India for wheels, mallets, planes, furniture, rice-pounders, oil and sugar mills, and for turnery (Gamble, Man. Ind. Timb. p. 279).

Propagated by seeds, easily cultivated, and is a very ornamental tree, suitable for avenues, &c. The tree is common in various parts of Nigeria—fairly extensive forests of it occur near the banks of the Okpara river, W. Prov. S. Nigeria (Thompson, Col. Rep. Misc. No. 66, 1910, p. 73), in Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 258), and Bauchi (Dudgeon, l.c.), &c. In Jamaica, where the tree often has a trunk diameter of 5 feet, it grows everywhere up to about 3000 feet in altitude (W. Indian Bull. ix. 1909, p. 314).

The yield of fruit from a large tree is given, in India at 5 or 6 maunds [411—493 lbs.] (Hooper, l.c. p. 13).

Ref.—"Tamarindi Pulpa," in Pharmacographia, Flückiger & Hanbury, pp. 224–227 (Macmillan & Co., London, 1879).——"*Tamarindus indica*," in Med. Pl. Bentley & Trimen, ii. No. 92, pp. 4 (Churchill, London, 1880).——"*Tamarindus indica*," in Med. Pflanzen, Köhler ii. 3¾ pages.——"*Tamarindus indica*," in Dict. Econ. Prod. India, Watt, vi. pt. 3-B, 1893, pp. 404–409.——"Tamarinde" in Indische Heil- und Nutzpflanzen, Tschirch, pp. 84–85 (R. Gaertners Verlagsbuchhandlung, Berlin, 1892).——"Tamarin," in Les Drogues Simples d'origine végétale, Planchon & Collin, ii. pp. 471–473.——"Tamarindus," in The National Standard Dispensatory, Hare, Caspari & Rusby, pp. 1514–1516 (Lea Brothers & Co. Philadelphia and New York, 1905).——The Tamarind, Lyon, Bureau of Agric. Philippine Is. Bull. No. 6, 1905, pp. 5–7.——"*Tamarindus indica*," in Pl. Util. du Congo, De Wildeman, ii. fasc. 1, Art. vi. pp. 151–153.——"Tamarind: The Uses and Composition of Tamarind Seeds," Hooper, in Agric. Ledger, No. 2, 1907, pp. 13–16.——"*Tamarindus indica*," in Les Vég. Utiles de l'Afrique Trop. Franç. fasc. iii. Chevalier, Perrot et Gérard, pp. 127–130 (Challamel, Paris, 1907).——"*Tamarindus indica*," in Comm. Prod. India, Watt, pp. 1066–1067.

BAIKIAEA, Benth.

Baikiaea insignis, *Benth.*; Fl. Trop. Afr. II. p. 309.

Ill.—Trans. Linn. Soc. xxv. t. 41; Engl. & Prantl, Pflan. iii. pt. 3, f. 102E.

Upper Guinea.

A handsome decorative tree. The flowers are 10 in. across when fully expanded, and the largest produced by any leguminous plant; they are very fugitive, lasting only for one night. A

plant raised at Kew in 1894 flowered in 1907, when about 15 ft. high (Kew Bull. 1909, p. 342). A young tree has also flowered in Dominica (Rep. Bot. St. Dominica, 1907–08, p. 2).

Ref.—" *Baikiaea insignis*," in Kew Bull. 1909, p. 342.——Agric. News, Barbados, 1909, p. 405.——*Baikiaea insignis*, Harms, in Notizblatt, App. xxi. No. 2, 1911, pp. 51–54.

DETARIUM, Juss.

Detarium senegalense, *Gmelin*; Fl. Trop. Afr. II. p. 313.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 59 (*D. microcarpum*); Ralph, Ic. Carp. t. 11. p. 5; Heckel & Schlagdenhauffen, Journ. Pharm. et de Chimie, 1890, (Reprint) ff. 1–7; Engl. & Prantl, Pflan. iii. pt. 3, f. 77 D–F; Volkens, Notizblatt, App. xxii. No. 1, 1909, p. 13, f. 5; Engler & Drude, Veg. Erde, ix. f. 662 (after Volkens).

Vernac. names.—Tawra (Hausa, *Barter*); Ogbogbo (N. Nigeria, *Dudgeon*); Beligbele (Sierra Leone, *Scott Elliot*); Dita (Gambia, *Brown Lester*); Dattock (Gambia, *O'Connor*, *Moloney*); [Detarr (Yoloff); Manbode (Mandingo) *Moloney*]; Bediwonua (Gold Coast, *Evans*).—Tallow Tree.

Oshun River Reserve; Nupe; Zungeru; Kabba; Banks of Guarara, N. Nigeria; and widely distributed in W. Africa.

Fruit edible (Barter & Scott Elliot, Herb. Kew), although there are two varieties—the edible one sweet, and a bitter variety which is regarded as poisonous. The mealy mesocarp, when cooked, is not unpleasant, with a slight flavour of gingerbread; beaten into a pulp it is made into a kind of comfit. The kernel has at times the odour of Tonquin bean, and a taste of hydrocyanic acid (Barter Mus. Kew). According to Dr. Baikie the seeds are beaten into a cake for feeding cattle in Nupe (Moloney, For. W. Afr. p. 336).

The young shoots boiled and mixed with "faringi" are used for the cure of fever in Sierra Leone (Scott Elliot, Herb. Kew).

The wood, has been exported from Nigeria to Liverpool under the name of "African Mahogany" (Thompson, Col. Rep. Misc. No. 51, 1908, p. 26); suitable for naval construction, carpentry work and fancy turning (Moloney, l.c.)

It forms a magnificent and lofty tree in S. Nigeria, confined to the evergreen forests and is somewhat uncommon (Thompson, l.c.); a small tree in dry rocky soil Nupe and common on hills near Jebba (Barter, Herb. Kew); growing on the roadside near Kabba (Elliott, l.c.) and common in open bush, Zungeru (Dalziel, l.c.), extremely abundant in localities where the subsoil is rocky, but does not attain very large dimensions, Gold Coast; grows freely from seed (Thompson, Col. Rep. Misc. No. 66, 1910, p. 88).

Ref.—" *Detarium senegalense*, in Les Végétaux Utiles de L'Afrique Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 97–102 (Challamel, Paris, 1907.——" Sur lés deux variétés de *Detarium senegalense*," Heckel & Schlagdenhauffen, in Journ. de Pharmacie et de Chimie 1890, (Reprint) pp. 1–16 (Marpon & Flammarion, Paris, 1890).

COPAIFERA, Linn.

Copaifera Guibourtiana, *Benth.*; Fl. Trop. Afr. II. p. 314.

Ill.—Pharm. Journ. [1] xvi. 1857, p. 370 (*Guibourtia copalliferae*).

Vernac. name.—Kobo (Sierra Leone, *Moloney*).

Sierra Leone Copal is obtained from this tree (Kew Bull. 1888, p. 281); valued 1909 at 6½*d.* to 1*s.* 11*d.* per lb. (Col. Rep. Misc. No. 63, 1909, p. 171).

The gum copal industry of Sierra Leone is stated to have been for some years past on the decline, and with a view to its re-establishment the Government in 1909 were taking steps to raise and distribute on a large scale young plants for planting out in Government Reserves and various parts of the Protectorate (The Sierra Leone Govt. Gaz. Nov. 20th, 1909, p. 715).

Ref.—"Some observations on the Copals of Western Africa," Daniell, in Pharm. Journ. [1] xvi. 1857, pp. 367–373 and pp. 423–426. ——"Observations on the Origin and the Geographical distribution of the Gum Copal in Angola," Welwitsch, in Journ. Linn. Soc. ix. 1867, pp. 287–302. "Copals de L'Afrique occidentale," (*C. Guibourtiana*, Bth.), in Gommes, Résines, De Cordemoy, in Ann. L'Inst. Col. Marseille, vi. fasc. 2, 1899, pp. 113–123.——"Copal Resin from Sierra Leone," in Col. Rep. Misc. No. 63, 1909, pp. 175–176.

There are no specimens of *Copaifera* from Nigeria in the Kew Herbarium, but the genus is of interest here as producing the true "Balsam of Copaiba" in Brazil (*C. Lansdorffii*, Desf.), Venezuela and Cent. America, &c. (*C. officinalis*, L.), British Guiana (*C. Martii*, Hayne, and *C. guianensis*, Desf.) &c.; as well as the "Sierra Leone Copal" mentioned above, "Inhambane" or "Mozambique Copal" (*C. Gorskiana*, Benth.), "Accra Copal," "Congo Copal," and possibly other African Copals are obtained from the species of this genus.

CYNOMETRA, Linn.

Cynometra Mannii, *Oliv.* Fl. Trop. Afr. II. p. 317.

Old Calabar; Lagos.

Wood close grained and heavy (Moloney, For. W. Afr. p. 337); has a specific gravity 0·9219 = 57·6 lbs. per cubic foot.

Ref.—*Cynometra Mannii*, Harms, in Notizbl. App. xxi. No. 2, 1911, pp. 35–39.

BURKEA, Hook.

Burkea africana, *Hook. f.*; Fl. Trop. Afr. II. p. 320.

Ill.—Hook, Ic. Pl. tt. 593–594; Warburg, Kumene Exped. p. 245, f. 98 (habit); Transv. Agric. Journ. iii. t. 10 (habit); Engl. & Drude, Veg. Erde, ix. p. 436, f. 371; p. 597, f. 516 (habit).

Nupe; Banks of Guarara River.

Yields a gum, Gold Coast (Dudgeon, Herb. Kew). The gum is described as occurring in semi-transparent tears—pale yellow to reddish-brown, of fair quality but inferior to that of *Acacia Senegal.* It would probably be saleable at about 15*s.* or 16*s.* per cwt., and if possible to collect it cheaply might be worth some attention (Col. Rep. Misc. No. 63, 1909, pp. 153, 154). Wood good for wagons and cabinet work (Rhod. Agric. Journ. viii. 1910, p. 208).

Ref.—"*Burkea africana*, Hook.," in Les Végétaux Utiles de l'Afrique Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 82–84.

ERYTHROPHLOEUM, Afzelius.

Erythrophloeum guineense, *Don*; Fl. Trop. Afr. II. p. 320 pro. parte.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 55 (*Filloea suaveolens*); Ralph, Ic. Carp. t. 9, f. 2; Bertoloni, Pl. Mozambique (Mem. Accad. Inst. Bologna, ii. 1850) p. 10, t. 3 (*Mavea judicialis*); Engl. & Prantl, Pflan. iii. pt. 3, f. 75 D–F; Ann. Inst. Col. Marseille, 1907, pp. 172, 249; Karst. & Schenck, Veg. bild. iv. t. 29 (habit); Volkens, Notizblatt, App. xxii. No. 1, 1909, p. 11, f. 4; Engl. & Drude, Veg. Erde, ix. f. 210 (after Volkens).

Vernac. names.—Erun or Obo (Yoruba, *Thompson*) Erun or Obo (Lagos, *Dawodu*); Arache (Cent. Div. S. Nigeria, *Thompson*); Elondo or Ebondo (Gaboon, *De Wildeman*); Eyo (Pahonia, *De Wildeman*); Protodon (Ashanti, *Thompson*); Kaya, or Kbandé (Sierra Leone, *Scott Elliot*); Bangi (Golo, Sudan, Bull. Imp. Inst. 1909, p. 22); Bourane (W. Africa, *Moloney*); Kura (Sudan, *Broun*).——Sasswood, Sassy or Casca Bark, Ordeal Bark, or Red Water tree.

Mamu Forests; Oshun River Reserve; Bassa; widely distributed in West tropical Africa.

The bark is poisonous, and an infusion of it is used in many parts of tropical Africa as an ordeal, especially in Sierra Leone and Liberia, and a decoction is used by the natives in West Africa for poisoning arrows (Moloney, For. W. Afr. p. 338). In Lagos it is used in a pounded state as a fish poison (Dawodu, Mus. Kew).

The wood is reported to have no value for export, though it is useful for constructional work; very hard and durable, specific gravity 0·896 = 56 lbs. per cubic foot (specimen from Uganda, Dawe, No. 757, Mus. Kew); weight per cubic foot 63 lb. (Bull. Imp. Inst. 1908, p. 238); used for building purposes on the Niger (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89).

Propagated readily from seed; confined to rocky banks of streams, in Meko and Shaki districts (Thompson, Rep. Tour through Meko and Shaki, 1910, p. 4); met with in the evergreen forests in the dry parts of the Gold Coast (Thompson, Col. Rep. l.c.); attains very large dimensions—bole 30 to 50 feet, 5 to 6 feet in diameter at about 5 feet from the ground—in the Budongo Forest (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 30); a tall tree common on laterite plateaux, and in valleys by water, Sierra Leone (Scott Elliot, Herb. Kew).

Ref.—"Recherches sur les Erythrophleum," etc., Planchon, in Ann. L'Inst. Col. Marseille, 2nd Series, v. 1907, pp. 161–313.

Erythrophloeum micranthum, *Harms, MSS.*

Tree 50–80 ft. high. Pinnae in 3–4 opposite pairs, 4–6 in. long; leaflets about 6 pair on each pinna, alternate, elliptic-oblong, acuminate, generally slightly emarginate at the apex, rounded or cuneate at the base, up to 4½ in. long and 1¾ in. broad, glabrous on both surfaces, main nerves about 7 pair, prominent on the lower surface. Flowers subsessile, crowded in rather large terminal panicles the branches of which are ferrugineous tomentellous; bracts minute. Corolla exceeding the calyx, pilose-tomentose. Legumes up to almost 5 in. long 1½ in. broad, rounded at the apex, rounded or very obtuse at the base, about 7 seeded.—*E. guineense*, Oliver Fl. Trop. Afr. ii. p. 320, pro parte.

Vernac. names.—Karku (Gold Coast, *Johnson*, *Evans*); Elondo Libreville, *Pierre*).

Brass (Barter, No. 3, Herb. Kew); Nun River (Mann, No. 482, 1860, Herb. Kew).

According to Barter (Herb. Kew) this is the "Sassa water" or "ordeal tree" of the Brass people, but not of Calabar. Bark used as a poison by the natives, Nun [Niger] river (Mann. Herb. Kew). The wood has a specific gravity 0·7794 = 48·7 lb. per cubic foot (Mus. Kew); used largely at Tarkwa for firewood, Gold Coast (Evans, Mus. Kew).

LEGUMINOSAE—MIMOSEAE.

PENTACLETHRA, Benth.

Pentaclethra macrophylla, *Benth.*; Fl. Trop. Afr. II. p. 322.

Ill.—Trans. Linn. Soc. xxiv. 1864, t. 37, ff. 1–7; Ann. Inst. Col., Marseille, iv. 1897, p. 183 (Vue d'un groupe de grands Owala), p. 186, f. 8 (Gousse ouverte d'Owala), p. 187, f. 9 (seeds); Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 90, f. 44.

Vernac. names.—Apara (Lagos, *Thompson, Dawodu*); Opaga, Opogga (Benin, *Thompson*); Athawah or Atawah (Fanti, Twi, Gold Coast, *Thompson*); Ekuana (Fanti, *Thompson*); Owala (Gaboon, *Barter*, *De Wildeman*, *Klaine*); Ebe, Boala, Bala, Sucupira, Sicopira, Mobala (Congo, *De Wildeman*); Ebe (Pahouin, *De Wildeman*); Kakung, Fai or Faire (Sierra Leone, *Unwin, Smythe*); Opochala (Ebo, Niger, *Moloney*, *Barter*); Secupira, Sucopira, or Sucupira (Princes Island, *Welwitsch*); Bokombola or Kombola (Kamerun, *Büsgen*); Pauco (W. Africa, *Merck*); Atta Beans (Gold Coast, Cat. Franco-Br. Exhib. 1908, p. 13).

Asaba; Old Calabar; Oban Hills Forest Reserve, and throughout West Africa.

The seeds are used as food by the natives in West Africa. They have been shipped from the South Coast to Antwerp, but the selling price—about £5 per ton—has not met the requirements of exporters, and the trade apparently has not made much progress (Bull. Imp. Inst. 1907, p. 14). Small consignments are imported for the manufacture of oil. They yield about 30 per cent. of oil suitable for soap-making; the residue after crushing has been described as a low-class feeding article worth about £5 per ton (Dunstan, Sierra Leone Roy. Gaz. Nov. 27, 1909, p. 731). The seeds (in 1909) for crushing purposes were valued at about £6 per ton (Col. Rep. Ann. No. 665, 1911, p. 33).

"Paucine" is an alkaloid obtained from the seeds ("Pauco Nuts"), *see* Pharm. Journ. [3] xxv. 1895, p. 834).

The bark is boiled down by the natives of the Gold Coast to make a lotion for sores (Boyle, Herb. Kew).

The wood is hard, suitable for turnery, wheelwright's work, arpentry and naval construction (De Wildeman, Pl. Util. Congo, 1904, p. 359), specific gravity 0·9609 = 60 lbs. per cubic foot (including bark); weight 62 lbs. per cubic foot (Bull. Imp. Inst. 1910, p. 239). Sample logs have sold at 1*s.* 7*d.* per cubic foot (Thompson, List of For. Trees, S. Nigeria, 1910, p. 4).

The tree is abundant in the moist evergreen forests of the plains in S. Nigeria (Thompson, Col. Rep. Misc. No. 51, 1908, p. 56), and common near villages. It is easily propagated by seeds.

Ref.—"Note on the structure and mode of dehiscence of the Legumes of *Pentaclethra macrophylla*," Oliver, in Trans. Linn. Soc. xxiv. 1864, pp. 415–420.——"Beurre d'Owala, *Pentaclethra macrophylla*," Heckel, in Annales l'Inst. Col. Marseille, iv. 1897 (1898), pp. 183–192.——"Oil Beans from S. Nigeria," in Bull. Imp. Inst. v. 1907, pp. 10–14, with analyses of oil and meal.——"Report on Fai Beans, *Pentaclethra macrophylla*," Dunstan, in Sierra Leone Roy. Gaz. Nov. 27th, 1909, pp. 730–731, with analyses of oil and cake.——"*Pentaclethra macrophylla*," Harms, in Notizblatt, App. xxi. No. 2, 1911, pp. 29–33.

PARKIA, R. Br.

Parkia biglobosa, *Benth.*; Fl. Trop. Afr. II. p. 324.

Ill.—Pal. de Beauv. Fl. Ow. Ben. ii. t. 90 (*Inga biglobosa*); Geel, Sert. Bot. vi. (*P. africana*); Rchb. Exot. iv. t. 231 (*P. africana*); Ralph, Ic. Carp. t. 10, f. 3; De Rochebrune, Toxicol. Afr. ii. fasc. 1, p. 148, f. 135; p. 159, ff. 138–139 (pod and seed); Pobéguin, Fl. Guin. Franç. t. 50.

Vernac. names.—Nété, Nitta or Nutta (Yoloff, *Moloney*); Nettie or Oule, Gambia, *Whitely*); [Nere (Nalou); Oullé (Ouolof, &c.); Neretou (Upper Niger); Doroa (Sokoto); Rounno (Bornou); Fraoba (Boulain, Bissagos) *De Rochbrune*]; Doura (Soudan, *Moloney*); Houllé (Sérère, &c., *Moloney*, *De Rochebrune*); Nadi (Sierra Leone, *Scott Elliot*); Kamdah (W. Africa, *Hillier*).—African Locust, Arbre Sacre, Café de Soudan.

West Tropical Africa.

The pulp of the pods is eaten and the parched seeds used like coffee as a beverage. The natives of the Sudan ferment the roasted seeds in water, and after pounding, make them into cakes for use as sauce (Moloney, For. W. Afr. p. 339). The pods contain a large proportion of saccharine matter, and the flour has been suggested as a source of sugar (Comptes Rendus, cxlvi. 1908, pp. 187–189), but there appears to be no claim to successful competition with the product of the sugar-cane (Inter. Sugar Journ. xi. 1909, p. 161).

The leaves and roots, beaten up with water, are used as a remedy for sore eyes on the Gambia (Kew Bull. 1908, p. 314).

The wood is suitable for carpentry work (Moloney, l.c.; De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 379).

The bark is used by the Mandingoes (Gambia) as a specific for toothache (Brown Lester, Kew Bull. 1892, p. 47).

May be propagated by seed. Common on laterite soil, Sierra Leone (Scott Elliot, Herb. Kew).

Ref.—"Sur le Néré ou Nété du Soudan (*Parkia biglobosa*)" et la puissance alimentaire de ses grainés employées au Soudan, Heckel, in Journ. de Pharm. et de Chimie, 15 June, 1887, et Bull. de la Soc. de Geog. de Marseille, 1887.——"*Parkia biglobosa*, in Toxicologie Africaine, De Rochbrune, ii. fasc. 1, 1898, pp. 147–173 (Octave Doin, Paris, 1898).——"*Parkia biglobosa*, in Pl. Utiles Congo, De Wildeman ii. fasc. 1, 1906, pp. 140-143.——"*Parkia africana*," in les Vég. Utiles de l'Afr. Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 114–118.——"*Parkia africana*," in Kew Bull. 1908, pp. 314–315.

Parkia filicoidea, *Welw.*; Fl. Trop. Afr. II. p. 324.

Ill.—Sim, For. Fl. and For. Res. Port. E. Afr. t. 44.

Vernac. names.—Irugba (Lagos, Oloke Meji, *Thompson*, *Foster*, *Dawodu*); Dorowa (Hausa, *Dudgeon*); Dorowa (Kontagora, *Dalziel*); Kundi or Nkundi (Nyasaland, *Purves*); Gumwi (Sierra Leone, *Unwin*); [Mudus, Lu (Sudan); Eru (Yoruba), Loensi (N. Nigeria), Bull. Imp. Inst.]; Mundi or Moondi (Echuabo, Quelimane, *Sim*).—West African Locust Bean.

Lagos, Oloke Meji, Zungeru. Widely distributed in West Africa.

The pods and seeds are used like those of *P. biglobosa*; recommended for fodder locally (Col. Rep. Misc. No. 31, 1905, p. 21). The leaves and pods pounded and mixed with broken stones form a hard cement, used to plaster the floors of native huts and the sides of indigo pits.

The pounded seeds are used to give a flavour (of Indian Soy) to native dishes (Barter, Herb. Kew) by the natives for making soup, and also as a fish poison in Lagos (Dawodu, Herb. Kew).

The wood weighs 39 lbs. per cubic foot, and is of little value (Bull. Imp. Inst. 1909, p. 21); the branches are used by the natives for making hoe handles (Thompson, List, of For. Trees, S. Nig. 1910, p. 5).

The bark contains from 12–14 per cent. of tannin (Bull. Imp. Inst. 1906, p. 96), and as a tanning material is stated to be worth about £2 10*s*. per ton; suitable only for the production of second class or lower grade leathers (l.c. p. 97).

Propagated by seed. The tree occurs in the dry open forests of S. Nigeria (Thompson, Col. Rep. Misc. No. 51, 1908, p. 62); and in the Shaki district its destruction is prohibited by law (*idem*, Rep. on Meko and Shaki Dist. No. 25, 1910, S. Nigeria, p. 4).

Ref.—"Pods of *Parkia filicoidea*," in Col. Rep. Misc. No. 31, 1905, N. Nigeria, Dunstan, pp. 22–23, with analysis.

ENTADA, Adams.

Entada scandens, *Benth.*; Fl. Trop. Afr. II. p. 325.

Ill.—Rheede, Hort. Mal. viii. tt. 32-34; ix. t. 77 (*Mimosascandens*); Rumpf, Amb. v. t. 4 (*M. scandens*); Ralph, Ic. Carp. t. 6, f. 3; Scheffer, Natuurk Tijdschr. Ned. Ind. xxxii. 1873, tt. 16–18 (*E. Pursaetha* and *E. Rumphii*); Vidal, Fl. For. Filip. t. 44a (pod and seed); De Rochebrune, Toxicol. Afric. ii. fasc. 1, f. 118, f. 122 (pod); De Wildeman, Etude Fl. Bas. Congo, ii. t. 75; Contr. U. S. Nat. Herb. ix. t. 56 (*Lens phaseoloides*).

Vernac. names.—Fuse, Fugi, or Quifuge (Golungo Alto, *Welwitsch*, *De Rochebrune*); [Neke (Zigona), Marokoh (Momboutton) *De Rochebrune*]; [Mutagusi (Echuabo), Mtaburi (Swahili) *Sim*]; Gogo (Manila, *Archer*); Gaye, Gadze, Gayi, Lodusong, or Bayog (Guam.); Gogo, Goyongbakai, Bayogo, or Balones (Philippines), Boja (Cuba), Tupe (Samoa), Kaka (Raratonga), Cacoon (W. Indies) *Safford*]; Poospatta (Ceylon, *Thwaites*); Makbo (Laos, *Becket*).—Sea-bean, Matchbox bean, Snuffbox bean, West Indian Filbert, Sword bean.

Apomu, S. Nigeria. Widely distributed in West Africa and throughout the Tropics.

The pod of this plant is the largest known, attaining sometimes 4 feet in length. In Angola the seed is used as a fetish or charm (Monteiro, Angola, i. p. 249). They are a common drift seed, and are often made into matchboxes, snuffboxes, spoons, etc. A native snuffbox made of the seed, from Abeokuta, is in the Kew Museum.

The rough stem fibres are used locally in many countries for making ropes. The bark is used in the Philippines as soap and for medicinal purposes (Tavera, *seq.*). Fish traps are made of the green stems in Guam (Safford, Pl. Guam, p. 308); Moloney (For. W. Afr. p. 339) mentions some minor uses of the plant in India and Java.

Ref.—"*Entada scandens*," in Toxicclogie Africaine, De Rochebrune, ii. fasc. 1, pp. 132–138; Botanique, Historique, Chimie, Physiologie, Thérapeutic.——"Mackay Bean, the seed of *Entada scandens*," Moss, in Pharm. Journ. [3] xviii. 1887, pp. 242–243.——"*Entada scandens*," in Med. Pl. Philippines, Tavera, pp. 106–107.

Entada sudanica, *Schweinf.*; Fl. Trop. Afr. II. p. 327.

Ill.—Schweinf. Reliq. Kotschyanae, tt. 8, 9.

Vernac. names.—Ogurobe (Lagos, *MacGregor*) ; Tawasa (Hausa, *Dudgeon*).

Nupe ; Lagos.

The bark steeped with a mixture of natron is given as an abortifacient (Dudgeon, N. Nigeria Gaz. July 31st, 1909, p. 160).

Occurs in the dry open forests of S. Nigeria (Thompson, Col. Rep. Misc. No. 51, 1908, p. 6) ; common in all soils Nupe (Barter, Herb. Kew), and in fields at Lagos (MacGregor, Herb. Kew).

PIPTADENIA, Benth.

Piptadenia africana, *Hook. f.* ; Fl. Trop. Afr. II. p. 328.

Ill.—Thompson, Col. Rep. Misc. No. 66, 1910, t. 16 ; Engl. and Drude, Veg. Erde, ix. f. 573.

Vernac. names.—Ewon (Lagos, *Dawodu*) ; Aga-Igi (Yoruba, *Thompson*) ; Ekhimi or Ikhimi (Benin, *Thompson*) ; Nchoumbou (Gaboon, *De Wildeman*) ; Ensale (Pahouin, *De Wildeman*) ; Bolondo (Cameroons, *Busgen*) ; Kuperf (Sierra Leone, *Unwin*) ; Dahomah, Dahumah or Odahuma (Gold Coast, *Thompson*) ; Ofrafraha (Tarkwa, Gold Coast, *Evans*) ; Páo Musence or Muzungo or Muneunza (Golungo Alto, *Welwitsch*); Mpewere (Mabira Forest, *Dawe*).

Lagos, Ife and Ilesha Forests, Niger ; common throughout the West Coast of Africa and extending to Uganda.

The wood is excessively hard and very durable (Thompson, Col. Rep. Misc. No. 51, 1908, p. 27) ; used for planks in S. Nigeria (Bull. Imp. Inst. 1908, p. 154) ; valued at 1¼*d.* to 1½*d.* per foot super (List of For. Trees, S. Nig, 1910, p. 3) ; suitable for cabinet work, carpentry, and turnery, but of doubtful value for export. Weight per cubic foot 53–56 lbs. (Bull. Imp. Inst. l.c. pp. 147, 155 ; 1910, p. 236). According to Thompson, however, the timber is excellent and has attracted the attention of timber brokers in the Liverpool market (Col. Rep. Misc. No. 66, 1910, p. 154). This is one of the trees not usually cut down for firewood owing chiefly to the difficulty of splitting into billets (l.c. p. 55).

Ref.—"*Piptadenia africana*," Harms, in Notizblatt, App. xxi. No. 2, 1911, pp. 22–25.

CYLICODISCUS, Harms.

The genus *Cylicodiscus* differs from *Piptadenia*, in having a disc between the stamens and the base of the gynophore, and in the longer pods.

Cylicodiscus gabunensis, *Harms*, in Engl. & Prantl, Pflan. Nachtr. i. (1897) p. 192.

A tree 90–100 feet high (30–40 m., fide *Soyaux*), glabrous except in inflorescence. Leaves bipinnate, petiole 5–12 lin. long, pinnae unijugate 5½–7½ in. long, each with 5–7 leaflets, leaflets alternate, shortly petioled, ovate to ovate lanceolate, oblique, acuminate mucronate at the apex, obtuse or rounded at the base, 1½—3½ in. long, 1–1¾ in. broad. Racemes spiciform, axillary, solitary or terminal panicled, bracts minute, rachis puberulous. Calyx small, campanulate, shortly 5-toothed, puberulous on the outside. Petals 5, much longer than the calyx, about 1 lin. long, minutely puberulous on the outside. Stamens 10, exserted. Ovary oblique, shortly and rather densely pilose, stipitate, the base of the stipe glabrous and surrounded by a small cup-shaped disc. Pod compressed, 16–28 in. (or fide

Harms, to almost 32 in.) long, about 1½ in. broad, valves woody, brown, faintly reticulate. Seeds pale brown, very thin, 2¾ in. long, 10 lin. broad, with a darker brown wing 2–6 lin. deep continuous round the margin except at the point of attachment (towards the base) of the rather long funicle. *Erythrophloeum gabunense*, Taubert; *Cyrtoxiphus Staudtii*, Harms.

Ill.—Engl. Bot. Jahrb. xxvi. 1898–99, t. v. f. E. (long. section of flower); Thompson, Col. Rep. Misc. No. 66, 1910, t. 17 (*Piptadenia* sp.).

Vernac. names.—Okan (Benin, *Thompson*, *Unwin*); Aja-Igi (Yoruba, *Thompson*); Odenya or Denya (Gold Coast, *Thompson*); Adadawa (Wassaw, Gold Coast, *Thompson*).——African Greenheart.

Oban Hills Reserve; Benin (Unwin, Herb. Kew) and throughout the greater part of W. Africa.

The wood of "Okan" is very hard and difficult to work, used in Benin to build houses (Thompson, Col. Rep. Misc. No. 51, 1908, p. 26). Sample logs have been sold on the Liverpool market under the name of "African Greenheart" at 1*s.* 3*d.* to 1*s.* 6*d.* per cubic foot (List of For. Trees, S. Nig. 1910, p. 3, under *Piptadenia* sp.).

ADENANTHERA, Linn.

Adenanthera pavonina, *Linn.* Sp. Pl. (1753), p. 384.

A tree 20 feet and upwards in height; deciduous. Leaves bipinnate with 8–12 pinnae, each with 12—18 leaflets. Flowers small yellowish, in short peduncled racemes, 2—6 in. long. Pod, 6—8 in. long, ½ in. broad; seeds 10—12, scarlet; ⅜ in. in diameter, lenticular, convex on both sides.

Ill.—Rheede, Hort. Mal. vi. t. 14 (*Mantsiadi*); Rumpf, Amb. iii. t. 109 (*Corallaria parvifolia*); Gaertner, Fruct. Sem. Pl. ii. t. 149; Lam. Encycl. t. 334; Jacq. Collec. iii. t. 23; Wight, Illust. i. t. 84; Ralph, Ic. Carp. t. 9, f. 7 (*A. pavoniana*); Bedd. Fl. Sylv. t. 46; Vidal, Fl. For. Filip. t. 44 B; Engl. & Prantl, Pflan. iii. pt. 3, f. 71 G—K; Greshoff, Nutt. Ind. Pl. t. 49; De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 125, f. 112.

Vernac. names.—Zauga-vara (Gaboon, *De Rochebrune*); [Koláles or Kulális (Guam), Bahay Casa (Philippines), La'anlopa (Samoa) *Safford*].——Red Sandal Wood, Coral Wood, Red Bead Tree, Circassian Seeds.

Native of India. Introduced to many tropical countries.

The seeds are used for ornamental purposes.

The wood, which yields a red dye, is used for house building and cabinet work, hard and durable, weighing unseasoned 62 lbs., and seasoned 56 lbs. per cubic foot (Beddome, Fl. Sylv. t. 46).

The tree is easily raised from seed, and grows quickly. Trees in the Botanic Garden, Old Calabar, were bearing seeds in 1899.

Ref.—"*Adenanthera pavonina*" in Toxicologie Africaine, De Rochebrune, ii. fasc. 1, pp. 124–132, Botanique, Historique, Chimie, Physiologie, Therapeutique (Paris, 1898).

TETRAPLEURA, Benth.

Tetrapleura Thonningii, *Benth.*; Fl. Trop. Afr. II. p. 330.

Ill.—Ralph, Ic. Carp. t. 10, f. 2; Baillon, Adansonia, vi. t. 4, f. 5 (pod); De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 139, f. 124, p. 141, ff. 126–127 (pod and seed).

Vernac. names.—Aridan (Lagos, Abeokuta, *Thompson*, *Punch*, *Dawodu*); Igmiokkra or Igmiakia (Benin, *Thompson*, *Unwin*); Osshosha (Ibo, *Thompson*, *Unwin*); Ogagouma, Ogagoumé, or Ogayouma (Gaboon, *De Rochebrune*, *Moloney*); Muanza (Golungo Alto, *Welwitsch*); Cuspira (St. Thomas, *Welwitsch*); Prekese (Gold Coast, *Thompson*); Bokumake (Cameroon, *Büsgen*).

The pods are used, roasted and ground, in the preparation of "black soup" in Old Calabar and elsewhere, a common native dish. No alkaloids or cyanogenetic glucosides have been found in the pods, but the soft pulp contains sugar, tannin and a small quantity of "saponin" (Col. Rep. Ann. No. 601, 1909, p. 44, and No. 630, 1909, p. 40).

Used for washing in Sierra Leone and other parts of the West Coast.

The wood is used by the natives for making doors, windows, and benches (Thompson, List of For. Trees, S. Nig. 1910, p. 4).

Ref.—"*Tetrapleura Thonningii*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 1, pp. 138–144, Botanique, Historique, Chimie, Physiologie, Therapeutique (Paris, 1898).——"*Tetrapleura Thonningii*," in Les Veg. Util. de l'Afrique Trop. Chevalier, Perrot & Gérard, iii. pp .130–133.——"*Tetrapleura Thonningii*," Harms, in Notizblatt, App. xxi. No. 2, 1911, pp. 20–22.

PROSOPIS, Linn.

Prosopis juliflora, *DC.* Prodr. ii. p. 447.

A tree up to 50 feet in height, with trunk a foot or more in diameter. Leaves deciduous. Flowers small, 1 lin. long, greenish white, fragrant. Pods 4 to 9 in. long, constricted, containing 10 to 20 small, brown, somewhat elliptical seeds.

Ill.—Kunth, Voy. Humb. and Bonpl. Mimosa, t. 33 (*P. horrida*), t. 34 (*P. dulcis*); Desc. Ant. viii. t. 550 (*Mimosa juliflora*); Eastwood, Trees California, t. 42, f. 1; Sargent, Silva N. America, iii. tt. 136–137; U.S. Dept. Agric. Div. Entom. N.S. Bull. No. 1, 1895, t. 7; Queensland Agric. Journ. vi. 1900, t. 186 (habit).

Cashaw, Algaroba, Mesquit Bean, Honey Locust, Honey Pod.

Native of the West Indies and Cent. America.

The pods are a good food for cattle, horses and pigs, though death has resulted on occasion after eating damp or undried pods, owing, it has been suggested, to the germination or swelling of the seed in the stomach. They are an important article of food with the Indians and Mexicans, who grind them into flour for baking purposes, and also to make a weak beer. A healthful beverage is made from the fresh pods. A gum which exudes from the stem and branches has similar properties to those of "Gum Arabic" (Hough, American Woods, vi. p. 28).

The wood is hard and durable; weight 62 lbs. per cubic foot; used in Jamaica for fence posts, footing telegraph posts, railway sleepers, boat-knees, fuel and for making charcoal (West Indian Bull. ix. 1909, p. 302); used in America for fence posts, and railway ties, fellies of heavy wheels, paving streets, furniture, firewood, and for making charcoal; specific gravity 0·7652=47·69 lbs. per cubic foot (Sargent, Silva, N. America, iii. p. 103).

This tree was recommended by Kew in 1887 for cultivation in Lagos and other West African Settlements.

It grows freely from seed, and when once established requires little or no cultivation. In Hawaii where the plant was casually introduced it has run wild on dry scrublands (Hutchins, Rep. on Forestry, B.E. Afr. 1909, p. 9). The chief requirements are a hot climate with a comparatively low rainfall, and deep soil; and it would probably succeed well in Northern Nigeria, more especially towards the extreme north.

Ref.—" *Prosopis juliflora*, Mesquite, Honey Locust," in Silva of N. America, Sargent, iii. pp. 101–104.——" *Prosopis juliflora*," in The American Woods, Hough, vi. No. 129, pp. 27–28 (Lowville, New York, 1895).——" The Algaroba or Mesquit Bean (*Prosopis juliflora*)," Brooks, in Queensland Agric. Journ. vi. 1900, pp. 259–261.

Prosopis oblonga, *Benth.*; Fl. Trop. Afr. II. p. 331.

Ill.—Schweinf. Reliq. Kotshyanae, t. 7 (*Anonychuim lanceolatum*); Volkens, Notizblatt, App. xxii. No. 1, 1909, p. 10, f. 3; Engl. & Drude, Veg. Erde, ix. f. 672.

Vernac. names.—Cambo (Gambia, *Haydon*); Abu Surug (Bahr-el-Ghazal, *Brown*); Ji (Golo, Sudan, Bull. Imp. Inst. 1909, p. 22).

Nupe, widely distributed in West Africa.

Bark used for tanning by the natives of the Sudan (Brown Herb. Kew); suitable only in this country for the production of lower grade leather (Bull. Imp. Inst. 1906, p. 97).

The wood is hard; weight per cubic foot 57 lbs. of doubtful value for export (l.c. 1909, p. 22).

Ref.—" *Prosopis oblonga* " in Les Veg. Utiles de l'Afrique Trop. Franc. Chevalier, Perrot & Gérard, iii. pp. 118–120.

DICHROSTACHYS, DC.

Dichrostachys nutans, *Benth.*; Fl. Trop. Afr. II. p. 333.

Ill.—Bruce, Abyss. Travels, v. t. 4 (Ergett Dimmo); De Candolle, Mem. Leg. t. 67 (*Desmanthus trichostachys*); Ralph, Ic. Carp, t. 8, f. 12 (*Desmanthus trichostachys*); Wood, Natal Pl. iii. t. 243; Sim. For. Fl. and For. Res. Port. E. Afr. t. 38A; Engl. & Drude, Veg. Erde, ix. f. 69.

Vernac. names.—Dundu (Katagum, *Dalziel*); Kara ? (Lagos, *MacGregor*); Mungenin (Loanda, *Gossweiler*); U-Gagaan (Natal, *Medley Wood*); Kadat (Arabic, White Nile, *Muriel*); Sasana (Ironga, Lorenzo Marques, *Sim*).

Katagum; Nupe; Lagos, extending through Tropical Africa to Natal.

Wood hard but too small to be of much practical use (Medley Wood, Natal Pl. iii. p. 20), except for fuel.

The plant is used for hedges at Gondokoro station (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 34).

A handsome decorative plant.

Grows in the coast regions and in dry places, dense low forests being sometimes composed exclusively of this plant in Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 194); common in dry hilly places, and in groves of *Adansonia*, forming at times dense thickets near Loanda (l.c. p. 308) where it attains a height of 8 feet (Gossweiler, Herb. Kew).

Ref.—" *Dichrostachys nutans*," in Les Veg. Utiles de l'Afrique Trop. Franc. Chevalier, Perrot et Gérard, iii. pp. 102–105.

MIMOSA, Linn.

Mimosa asperata, *Linn.*; Fl. Trop. Afr. II. p. 335.

Ill.—Houston, Reliq. t. 24; Bruce, Abyss. Travels, vii. t. 7 (Ergetie Krone); Kunth, Voy. Humb. & Bonpl. Mimosa, t. 9 (*M. pellita*); De Candolle, Mem, Lég. t. 63; De Rochebrune, Toxicol. Afr. ii. fasc. 1, p. 145, f. 131.

Vernac. names.—Kardegi (Katagum, *Dalziel*); Kwenuwapi (Mrima, *De Rochebrune*); Logogonee (Madi, *De Rochebrune*); Shagara-et-fas (Arabic, Senaar, *Muriel*); Mosaghani (Hameg, *Muriel*); Soune (Senegal, *Moloney*).

Katagum; Nupe.

Wood suitable for carpentry (Moloney, For. W. Afr. p. 341).

Found by river banks, Katagum and elsewhere (Dalziel, Barter, Herb. Kew).

Ref.—"*Mimosa asperata*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 1, pp. 144–147: Botanique, Historique, Chimie, Physiologie, Therapeutic (Octave Doin, Paris, 1898).

Mimosa pudica, *Linn.*; Fl. Trop. Afr. II. p. 336.

A small spinous shrubby plant 1—2 ft. high. Flowers capitate, pink, 1—2 inflorescences borne in each axil. Pod ½ in. long, 3—4 seeded, constricted, each constriction with a seed contained in it falling away from the sutures when ripe.

Ill.—Commelin, Hort. Med. Amstel. Pl. t. 29 (*Aeschynomene spinosa*); Andr. Rep. viii. t. 544; Dict. Sc. Nat. t. 258; Bot. Reg. (1825) t. 941; Burnett, Pl. Util. ii. t. 46*b*; Spach, Suites (Hist. Nat. des Vegetaux) t. 1. f. 2; Nicholson, Dict. Gard. ii. p. 370; Engl. & Prantl, Pflan. iii. pt. 3, f. 41 (leaf) f. 69 A—E.

Sensitive Plant, Humble Plant, Bashful Mimosa.

Native of Tropical America. Naturalized in Tropical Africa.

The root is emetic and poisonous in large doses (Heckel, Ann. Inst. Col. Marseille, 1897, p. 143).

The plant is mentioned as a fodder for cattle in Java (Tropenpfl. 1902, p. 427), recommended in the Fed. Malay States and Ceylon as a cover plant, to keep down other weeds, and for green manuring (Bull. Imp. Inst. 1907, p. 441; Philippine Agric. Rev. 1909, p. 289; Bamber & Holmes, Roy. Bot. Gdn. Ceylon, Circ. No. 17, 1911, p. 226). In Batu Tiga it is reported that over six acres planted, a dense cover has been made, and the plants have kept in check all weeds except lalang. As a mulching material plants 10 months old cut over to six inches above the ground, yielded at the rate of 2950 lbs. per acre (Campbell, Agric. Bull. Str. Sett. and Fed. Malay St. 1909, p. 446), over 13 tons per acre, per annum in Ceylon (Bamber & Holmes, l.c.).

LEUCAENA, Benth.

Leucaena glauca, *Benth.*; Fl. Trop. Afr. II. p. 337.

Ill.—Ralph. Ic. Carp. t. 6, f. 2; Vidal, Fl. For. Filip t. 45B; De Wildeman, Ic. Hort. Thev. vi. t. 206; Sargent, Silva, N. America, iii. t. 139.

Vernac. name.—Bois Sophie (Dominica, *Moloney*).

The seeds are commonly used for ornamental purposes; but are unsuitable for feeding purposes (Col. Rep. Ann. No. 656, 1910, p. 34).

The plant is reputed to be injurious to animals, it is said to cause the hair to drop out from the tails and manes of horses (Safford, Pl. Guam, p. 151).

The wood is durable and suitable for fancy cabinet work.

Grows freely from seed, and stout branches root freely; makes a good hedge plant; grown in Java for terracing tea and as a shade for coffee; recommended in Ceylon as a cover plant and green manure for rubber and other estates—cut down to about 3 feet for cover and capable of yielding yearly over 20 tons per acre of mulching material (Bamber & Holmes, Roy. Bot. Gdn. Ceylon, Circ. No. 17, 1911, p. 225).

Ref.—"*Leucaena glauca*," in Silva of N. America, Sargent, iii. pp. 111–112.

ACACIA, Willd.

Acacia albida, *Delile*; Fl. Trop. Afr. II. p. 339.

Ill.—Delile, Egypte, t. 52, f. 3; Bentham, Mimoseae, Trans. Linn. Soc. xxx. t. 70; Engl. & Prantl. Pflan. iii. pt. 3, f. 67 (habit); Engl. Pflan. Ost Afr. t. 20, f. A (pod and seed); De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 187, f. 159 (pod); Notizblatt, Bot. Gart. Berlin, iv. 1906, p. 199; Sim, For. Fl. and For. Res. Port. E. Afr. t. 34; Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 82, f. 38; Engl. & Drude, Veg. Erde, ix. f. 41 and f. 467 (habit).

Vernac. names.—Gawo (Katagum, *Dalziel*); Gawo (Kano, *Dudgeon*); Kawaru (Hausa, *Barter*); Haraz (Nubia, *Grant*); Haraz (Arabic, *Muriel*, Herb. Kew); Ana (Hottentot, *Galpin & Pearson*, Herb. Kew); Newapf, Bolela (Port. E. Afr. *Sim.*); Harras (Arabic, *De Rochebrune*); Mamméne (Tigreen, *De Rochebrune*).——Gomme Salabreda, Gomme Vermicellée.

Katagum (Dalziel, No. 53, 1908, Herb. Kew); Kano (Dudgeon, No. 4, 1909, Herb. Kew); Komadugu Waube, N. Bornu (Elliott, No. 142, 1904, Herb. Kew); widely distributed in the Sudan region, and extending to Mozambique.

Yields a gum similar to gum arabic (Mus. Kew; Moloney, For. W. Afr. p. 343). Wood used for making doors, Rhodesia (Rhod. Agric. Journ. viii. 1910, p. 205).

The usual camel food, Katagum (Dalziel, l.c.); leaves eaten by goats and the bark used in curing leather, Nubia (Grant, Trans. Linn. Soc. xxix. p. 67).

Common in the Kano district (Dudgeon, l.c.); rare as far south as Kontagora, abundant northwards to Sokoto, where it is almost the predominant tree (Dalziel, Bull. Imp. Inst. 1907, p. 257, *Acacia* sp.).

Ref.—"Gomme du Senegal," Heckel, in Ann. L'Inst. Col. Marseille, vi. 1899: Gommes, Résines, pp. 18–29 (in parts).

Acacia arabica, *Willd.*; Fl. Trop. Afr. II. p. 350.

Ill.—Hayne, Darst. Beschr. Gewächse, x. t. 32, t. 34 (*A. vera*); Wagner, Pharm. Med. Bot. t. 177; Nees von Esenbeck, Plant. Medic. Düsseld. t. 333; Bentham, Trans. Linn. Soc. xxx. 1864, t. 69 (pods); Roxb. Pl. Corom. t. 149 (*Mimosa arabica*); Spach Suites (Hist. Nat. des Vegetaux) t. 1; Ralph, Ic. Carp. t. 3, f. 6; Schnizlein, Ic. iv. t. 277, f. 1; Bedd. Fl. Sylv. t. 47; Engl. Pflan. Ost Afr. t. 20, f. F (pod); Ann. L'Inst. Col. Marseille, vi. 1899, fasc. 2, p. 13, f. 1 (after Baillon); Sim, For. Fl. and For. Res. Port. E. Afr. t. 36, f. B; Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 87, f. 42; De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 178, f. 148, p. 189, ff. 160, 161 (*A. Neb-neb*).

Vernac. names.—Siludi (Fulani, *Shaw*, No. 73, 1910, Herb. Kew); Bagarua or Baggarua (Katagum, *Dalziel*, *Shaw*); Baggarua (Hausa, *Dudgeon*); Sant (Sudan, Bull. Imp. Inst. iv. 1906, p. 95); Sant

(Arabic, *Muriel* No. 1 Herb. Kew); Soonud (Nubia, *Grant*); Garad (Arabic (for fruit), *Muriel* No. $\frac{L}{2}$ Herb. Kew); Minga (Nyasaland, *Purves*, Herb. Kew); Nebneb (Yoloff, *Moloney*, For. W. Afr. p. 343); Nebneb, Bano (Gambia, *Llewellyn*, *Dudgeon*); Babool (India, *Watt*, *Gamble*); [Tchenga or Chenga (Ironga, Lorenzo Marques), Shangaira, Chicao (M'Chopes), Isitwete (Swazi), Mungu-m-cheu, Egamo-sena (Echuabo) *Sim*]——Gambia Pods, Egyptian Mimosa, Egyptian Thorn, Gum Arabic, Babool Gum.

Katagum (Dalziel, No. 54, Herb. Kew); Niger (Barter, Fl. Trop. Afr. ii. p. 350); Nupe (Barter, Nos. 1595 and 1626, Herb. Kew); Banks of Komadugu, Waube, N. Nigeria (Elliott, No. 136, 1904, Herb. Kew); N. Nigeria (Dudgeon, No. 56, 1907, Herb. Kew); Yola, N. Nigeria (Shaw, No. 73, 1910, Herb. Kew). Widely distributed in Tropical Africa, India, &c.

The pods are used for tanning in Katagum (Dalziel, No. 54, Herb. Kew), in Kano (Dudgeon, No. 56, Herb. Kew), near Bayada, Blue Nile (Muriel, $\frac{L}{2}$ Herb. Kew); in Kontagora (Bull, Imp. Inst. 1907, p. 257), in Nupe (Barter, Nos. 1595, 1626, Herb. Kew), in N. Nigeria —no precise locality given (Shaw, No. 2, 1909, Herb. Kew), and for dyeing clothes a dingy yellow in Nubia and Egypt (Grant, Trans. Linn. Soc. xxix. p. 68). Pods from N. Nigeria have been found to yield a pale, fawn-coloured, but rather soft leather (N. Nigeria Gaz. 31st July, 1908, page 134), to contain 26·69 per cent. of tannin (Col. Rep. Ann. No. 601, 1909, p. 41); and worth about £6 per ton in England (Col. Rep. Ann. No. 633, 1910, p. 25).

In India the bark is of greater importance for tanning purposes, and the pods used (Cawnpore Tanneries) almost exclusively to remove the lime from skins and hides before tanning them with "babul" bark (Watt. Comm. Prod. India, p. 7). The pods have been found to coagulate rubber latex (Agric. News, Barbados, 1909, p. 169); and used for making ink by the natives of the Gambia (Llewellyn, Mus. Kew).

The leaves and green pods are given as fodder to goats, sheep, cows, and camels, and the tender young pods are sometimes eaten as a vegetable (l.c.).

The seeds pounded and mixed with dates are made into an intoxicating drink, Muscat (Grant, l.c).

This tree yields a large proportion of the "Gum Arabic" of commerce—Morocco, Mogador or Brown Barbary and East Indian (so-called, because it comes into commerce from Aden and Red Sea ports, *viâ* Bombay). Yields an abundance of transparent gum, Nupe (Barter, No. 1208, Herb. Kew), and a good soluble adhesive gum, Mozambique (Johnson, No. 289, 1908, Herb. Kew).

See under *A. Senegal* for particulars of "Gum Arabic"—uses, commerce, &c.

The wood is hard and durable; weight 49–58 lbs. per cubic foot. In India it is used for wheels, well curbs, sugar and oil-presses, rice-pounders, agricultural implements, tool handles, boat building, rafters, railway sleepers, and fuel (Gamble, Man. Ind. Timb. p. 293); in the Nile region for making boats (Grant, l.c.; Muriel, Indian Forester, xxviii. 1902, p. 49).

Brandis (Ind. Trees, p. 264) mentions a remarkable variety—pod broader and much less constricted between the seeds, bark more deeply cracked and exfoliating, branches twisted and interlacing—called "Kauli" or "Kowri Babul," in Berar and Khandeish, and "Vedi Babul" in Poona, of which the wood is considered fit only for firewood. It may be mentioned that *A. arabica*, the pods especially, also varies considerably in Africa.

May be propagated by seed or cuttings. The seeds require soaking in water for a few days before sowing, to hasten germination. They may be sown in rows, or broadcast in prepared ground, or singly in bamboo pots, and thinned or planted out to distances in the final stage of from 10 to 20 feet. The trees come to maturity in about 3 years, though if grown for the bark, according to Watt (Comm. Prod. India, p. 3), they are considered at their best when from 4 to 6 years old. In order to secure the best financial results for tanning bark and fuel it is recommended that the trees be uprooted and the plantations renewed every 6 or 10 years.

If grown for timber from 20 to 40 years would be required for full development.

A comparatively good soil and dry climate are essential conditions under cultivation.

Trees 8 and 12 feet in circumference are recorded as growing on high and dry ground, in the Nile region (lat. 10° N.) (Grant. l.c. p. 67).

Ref.—"*Acacia arabica*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 17–27.——"*Acacia Nebneb*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 1, pp. 177–179.——"Gomme Arabique, *Acacia arabica*," Heckel in Ann. L'Inst. Col. Marseille, vi. 1899, 2nd fasc. : Gommes, Résines, pp. 12–18.——"*Acacia arabica*," in Man. Indian Timbers, Gamble, pp. 292–294.——"Indian Gum Arabic, *Acacia arabica*," in Agric. Ledger, No. 2, 1902, pp. 63–74; and in Comm. Prod. India, Watt, pp. 2–8 : Habitat, Cultivation (including cost of production and profit), Gum, Uses, Tanning and Dyeing bark, Tanning Pods, Timber.——"*Acacia arabica*," in Bull. Imp. Inst. i. 1903, pp. 91–92.——"*Acacia arabica*," in Les Veg. Utiles de L'Afrique Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 52–57 (Challamel, Paris, 1907).——"Results of the Examination of Gambia Pods (*Acacia arabica*) from Northern Nigeria," in N. Nigeria Gaz. 31st July, 1908, p. 134.

Acacia ataxacantha, *DC.*; Fl. Trop. Afr. II. p. 343.

Ill.—De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 184, f. 155 (pod).

Vernac. names.—Ewon (Lagos, *MacGregor*).—Gommier blanc (*De Rochebrune*, l.c.).

Lagos (MacGregor, No. 261, Herb. Kew); Oloke Meji (Foster, No. 111, Herb. Kew); Geidam, N. Bornu (Elliott, No. 134, 1904, Herb. Kew).

Stated by De Rochebrune (l.c. fasc. 2, p. 393) to yield a "gum senegal" of second quality.

Used for making hedges and stockades in Sierra Leone (Scott Elliot, No. 4293, Herb. Kew).

Ref.—"*Acacia ataxacantha*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 1, pp. 183–185 (Octave Doin, Paris, 1898).

Acacia campylacantha, *Hochst.* ex. A. Rich. Tent. Fl. Abyss. i. p. 242.

[*A. Catechu*, Oliver, Fl. Trop. Afr. ii. p. 344, *non* Willd.]

Ill.—Schweinf. Pl. Nil. t. 1; Engl. Pflan. Ost. Afr. t. 20, f. D (*A. Catechu*, pod).

Vernac. names.—Massagi (Hausa, *Dudgeon*); Ede (Oloke Meji, *Foster*); Ede (Yoruba, *Thompson*); Kakamut (Sudan, *Muriel*); M'wombeh (Madi, *Grant*).

Lagos (Foster, No. 82, 1906, Herb. Kew); Kano, Zaria, N. Nigeria (Dudgeon, No. 5, Herb. Kew); Katagum (Dalziel, No. 51, 1907, Herb. Kew).

The bark and roots are used medicinally in S. Nigeria. The wood is rose coloured and close grained (Thompson, List of For. Trees, S. Nig. p. 4, under *A. Catechu*). A valuable timber tree, Blue Nile (Muriel, Indian Forester, xxviii. 1902, p. 49).

"Ede" is a common tree, often gregarious in the Meko and Shaki District, Western Province, S. Nigeria (Thompson, Rep. Tour. Meko & Shaki, No. 25, 1910, S. Nig. p. 4, under *A. Catechu*); plentiful in a very dry part of forest on poor rocky soil between Iwo and Ede, and in general occurs in the dry open forests of S. Nigeria; natural regeneration prolific (Col. Rep. Misc. No. 51, 1908, pp. 6, 12, and 62, under *A. Catechu*); common in open grass country, and sometimes forming almost pure thickets in the Gold Coast (Col. Rep. Misc. No. 66, 1910, p. 91).

Found as a thorny tree in Katagum (Dalziel, No. 51, Herb. Kew); the thorns—described by Grant (Trans. Linn. Soc. l.c.) "black and hard as iron," "the worst in Africa"—suggest a use as a fence or stockade, but for producing "cutch" it would perhaps be better to rely on the Indian plant (*Acacia Catechu*, Willd.).

It is singular that "cutch," the main product of *A. Catechu* in India, so far as can be ascertained, has never been produced in Africa, and according to Thompson (Col. Rep. Misc. No. 66, l.c.), the heartwood, from which the Catechu is extracted in Burma, is not well developed in the African plant.

Acacia Dudgeoni, *Craib*, in Kew Bull. 1912, ined.

Allied to *A. Senegal*, Willd., from which it can readily be distinguished by its more numerous pinnae (up to 10–11 pair) and leaflets (up to 20 pair to each pinna).

Young branches straight, reddish, striate, thinly pubescent, infrastipular spines turned upwards and inwards, about 2 lin. long, infrafoliar recurved, slightly longer and stouter than the lateral. Leaves bipinnate, petioles 3–6 lin. long, thinly pubescent, provided with a small sessile gland on the upper surface near the base, pinnae up to 10–11 pair, 1 in. long, the rachis having a small sessile gland between the top pair of pinnae or 2–3 glands, one each between the top 2 or 3 pairs of pinnae, leaflets up to 20 pair per pinna, linear-oblong or linear-oboval, rounded at the apex, about 1½ lin. long, ½ lin. broad. Spikes cylindric, solitary, axillary, 1–1¾ in. long, peduncle nearly ¾ in. long. Calyx ¾ lin. long lobed to about the middle, provided with a few erect scattered hairs. Corolla but slightly exceeding the calyx. Pod shortly stipitate, 1, 2 or 3 seeded, 1¼–3½ in. long, ¾–1 in. broad, glabrous, valves reticulate as in *A. Senegal*, but slightly thinner than in that species.

Borgu, N. Nigeria (Dudgeon, No. 58, 1907, Herb. Kew); Kontagora (Dalziel, No. 41, 1906, Herb. Kew).

Produces a fine clear gum; tree very common in Borgu (Dudgeon, l.c.). It is probable that this is the gum from Kontagora mentioned as being "of good quality," in Bull. Imp. Inst. vi. 1908, pp. 48, 49, and in Col. Rep. Misc. No. 63, 1909, p. 153, under *Acacia Caffra.* since Dudgeon's No. 58 was at one time referred to this species.

Acacia Farnesiana, *Willd.*; Fl. Trop. Afr. II. p. 346.

Ill.—Lam. Encycl. t. 846, f. 1 (*Mimosa Farnesiana*); Duhamel, Traite des Arbres, ii. t. 28 (*Mimosa Farnesiana*); Desc. Ant. i. t. 1 (*Mimosa Farnesiana*); Wight, Ic. Pl. Ind. Or. i. t. 300 (*Vachellia Farnesiana*); Bedd. Fl. Sylv. t. 52; Bentham, Mimoseae, Trans. Linn. Soc. xxx. t. 69 (pods); Piesse, Art Perfum. p. 107; Sargent, Silv. N. America, iii. t. 141; Rchb. Ic. Fl. Germ. t. 2052, ff. 1–8.

Vernac. names.—Bonni (Iwaraja, S. Nigeria, *Foster*); [Opoponax (S. U. States); Haisache (Texas); Aromo (Philippines, Guam) *Safford*]; Cassie (French).—Black Thorn, Farnesian Cassia.

Iwaraja, S. Nigeria (Foster, No. 179, 1907, Herb. Kew); banks of Gurara river, N. Nigeria (Elliott, No. 184, 1906, Herb. Kew). Widely distributed in tropical and sub-tropical regions of the World.

A choice perfume is obtained from the flowers, usually called "Cassie," for which purpose it is cultivated chiefly in the south of Europe, especially on the Riviera. The perfume is obtained either by distillation or by the "enfleurage" process—absorption of the perfume in olive-oil or specially prepared fat.

A gum is obtained from the tree, which has been compared with that of *A. arabica* as a second-grade product among the gums of commerce (Col. Rep. Misc. No. 63, 1909, pp. 158, 160).

The pods are used in the preparation of a black-dye in Angola, with which the natives stain the cloths called "Mabella" or "Mabéla," made from Palm-leaves (Hiern, Cat. Welw. Afr. Pl. i. p. 194); and a decoction of them is used in Mexico for making ink (Sargent, Silva, N. America, iii. p. 120); pounded and boiled in water, and used to blacken leather (West Indian Bull. ix. 1909, p. 329).

The wood is very hard and tough; used for ship's knees, tent-pegs, ploughs, &c. (Beddome, Fl. Sylv. t. 52); for posts—very durable under ground—and for cabinet work (West Indian Bull. l.c.); weight, 49–71 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 292).

May be propagated by seed, which germinates better after soaking. Raised in nurseries, they can be planted out in permanent places when strong enough, about 12 ft. apart. A fairly rich, deep, well-drained soil, and exposure to full sunlight are essential conditions. The trees (in Cannes) begin to bear flowers after the third year, and each tree when full grown (about 12 ft. high) produces about two pounds weight of flowers,—two kilos. of which will perfume one kilo. of grease (Piesse, Art Perfum. p. 108).

Growing as a low tree, Guarara river, N. Nigeria (Elliott, Herb. Kew), a thorny shrub 4 to 5 ft. high in dry places, Accra (Brown, Herb. Kew); tree 30 to 40 ft. high in damp places, Victoria Falls (Allen, Herb. Kew); at an altitude of 4500 ft. Uganda (Dawe, Herb. Kew); a tree 12 ft. high in moist argillaceous soil, at an altitude of 900 ft., Stanley Pool, Congo (Hens, No. 8, Herb. Kew). Makes a good hedge plant if kept well cut, and cultivated generally for decorative purposes. The tree does not appear to be of much importance for perfumery outside the South of France.

Ref.—"Cassie (*Acacia Farnesiana*)," in The Art of Perfumery, Piesse, pp. 106–110 (Longmans, Green & Co., London, 1879).——

"*Acacia Farnesiana*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 48–50.——"The Cultivation of *Acacia Farnesiana* or Cassie in Europe," Naudin, in Garden and Forest, iv. 1891, pp. 309–310.——"Cassie" in Odorographia, Sawer, pp. 114–116 (Gurney & Jackson, London, 1892).——"*Acacia Farnesiana*, Huisache, Cassie," in Silva of North America, Sargent, iii. pp. 119–121.——"*Acacia Farnesiana*," Heckel, in Ann. L'Inst. Col. Marseille, vi. 1899 : Gommes, Résines, pp. 30-31.——"The Cassie Perfume," Watt, in Agric. Ledger, No. 2, 1902, pp. 59–60.——"*Acacia Farnesiana :* Usages et méfaits," in Journ. D'Agric. Trop. iv. 1904, pp. 334–336.——"*Acacia Farnesiana*" in Pl. Utiles du Congo, De Wildeman, ii. fasc. 1, pp. 105-108 (Spineux & Co., Bruxelles, 1906).

Acacia mellifera, *Benth.* ; Fl. Trop. Afr. II. p. 340.

Ill.—Kotschy, Pl. Tinneanae, t. 1 ; Engl. Pflan. Ost. Afr. t. 20, f. B (pod) ; De Rochebrune, Toxicol, Afric. ii. fasc. 1, p. 186, f. 158 (pod) ; Notizblatt, Bot. Gart. Berlin, iv. 1906, p. 209 ; Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 84, f. 40 ; Engl. & Drude, Veg. Erde, ix. f. 45 (after Harms.).

Vernac. names.—Kittz Tekker (Arabic, *De Rochebrune*) ; Kittur (Arabic, [Blue Nile] *Muriel*, No. $\frac{L}{85}$ Herb. Kew).—Gomme de Souakim, Gomme Talha (*De Rochebrune*, l.c.).

River Awan, Yoruba (Barter, No. 1144, Herb. Kew) : Niger (Barter).

Yields a gum like gum arabic (Barter, l.c.) ; bark used for making sacks—used for conveying *Acacia* gum—and for ropes, Sudan (Muriel, Herb. Kew). Bees collect large quantities of honey from the flowers (Moloney, For. W. Afr. p. 342).

The tree is most abundant a few miles from the river Awan on the Yoruba side (Barter, l.c.).

Acacia Senegal, *Willd.* Sp. Pl. iv. p. 1077.

[*A. Verek*, Guill. et Perr. Fl. Trop. Afr. ii. p. 342.]

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 56 (*A. Verek*) ; Zippel, Ausl. Handels. Nährpfl. t. 38 (*A. Verek*) ; Schweinf. Reliq. Kotschyanae, t. 3 (*A. Verek*) ; Linnaea, xxxv. t. 22a (*A. Verek*) ; Flückiger, Gummi und Bdellium, Senegal, p. 10 (*A. Verek*) ; Bentl. & Trimen, Med. Pl. t. 94 ; Köhler, Med. Pflan. i. ; Engl. & Prantl, Pflan. iii. pt. 3, f. 68 ; De Rochebrune, Toxicol. Afric. ii. fasc. 1, p. 176, f. 146 ; p. 180, f. 150 (pod & seed) ; Ann. Inst. Col. Marseille, vi. 1899, p. 20, f. 2 ; Engl. Pflan. Ost. Afr. Part B, p. 424 ; Brandis, Ind. Trees, p. 266 ; Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 83, f. 39 ; Engl. & Drude, Veg. Erde, ix. ff. 64, 244.

Vernac. names.—Dakwora (Katagum, *Dalziel*) ; Hashab (Sudan, Bull. Imp. Inst. vi. 1908, p. 36) ; Kolkol (Bornu, *Dalziel*) ; Harhass (Arabic, Bull. Imp. Inst. 1910, p. 359) ; Uerek, Verek (Ouoloff, *De Rochebrune*, l.c. p. 175, *A. Verek*) ; Haschab (Arabic, De Rochebrune, l.c.) ; Hashab (Arabic, *Muriel*, No. $\frac{L}{135}$, Kordofan, Hb. Kew) ; Garandak (Hameg, *Muriel*, No. $\frac{L}{169}$, Kordofan, Herb. Kew) ; Alloba (Arabic (for the fruit), *Muriel*, No. $\frac{L}{169}$, Herb. Kew).—Gum Arabic, Senegal Gum, Kordofan Gum, Turkey Gum, Gomme du Senegal ; Gomme du bas du fleuve, Gomme du haut du fleuve.

Katagum (Dalziel, No. 55, 1907, Herb. Kew) ; native of Senegal and widely distributed in tropical Africa. Cultivated in India.

Yields the true "gum arabic" of commerce, usually known as "Kordofan," "Picked Turkey," "White Senaar," or "Senegal gum"; graded according to colour, size, and general appearance, as "Middle White," "Middle siftings"; "Very large," "Large," "Middle" or "Small" Brown; "Red"; "Washed," &c. (Mus. Kew). It is used for giving lustre to crape and silk, for thickening colours and mordants in calico printing, in the manufacture of ink and blacking, as a mucilage, for confectionery and for medicinal purposes.

It is more abundant in the dry season, exuding usually at the bifurcation of the branches. In Kordofan the gum is obtained from both wild and cultivated trees, and in the gardens or "geneinas" the trees are artificially cut—strips of the outer bark being removed—shortly after the rains cease; the first collection is made about 60 days after cutting and the garden is completely picked over every fourth day afterwards until the rains begin again and new leaves appear, at which stage the exudation ceases. Young trees, 3–4 years old, 8 to 10 ft. high and 6 to 8 in. in girth produce gum, and the period of production is given at from 3 to 20 years. A plantation of about 10 acres has been estimated to yield from 1200 to 1500 lbs. of gum in the course of a season (Muriel, Indian Forester, xxviii. 1902, p. 54; Col. Rep. Misc. No. 63, 1909, p. 143). The gum exudes freely from the stem and branches during the dry season in Bornu and at once forms tears of a beautiful amber colour (Wallace, Col. Rep. Ann. No. 551, 1907, p. 75).

"Kolkol" gum from the Bornu Province was valued in London (Jan. 1910) at 24*s.* per cwt. for large grade, 27*s.* for medium grade, and 28*s.* per cwt. for small grade; the colour and strength of the large grade was of excellent quality for use in confectionery, being described by the manufacturers as similar to good Galam (Senegal) (Bull. Imp. Inst. 1910, p. 359).

Gum Arabic or Gum Acacia realized (April, 1911) 54*s.* per cwt. for "fine white Soudan" (Chem. & Druggist, April 15th, 1911, p. 59).

The exports from Nigeria (of "Gums," which may include other sorts) for 1908, was 1,136,531 lbs., value £9532; and in 1909, 730,348 lbs., value £6264 (Govt. Gaz. S. Nigeria, App. B. 13th Feb. 1910).

The total imports into England from Nigeria in 1908, quoted as "Gum Arabic," were given at 10,540 cwts., value £12,719; in 1909, 7720 cwts., value £8945; and from all sources in 1908, 63,786 cwts., value £95,363; in 1909, 84,710 cwts., value £134,136—including Asiatic Turkey, Egypt, Morocco, Persia, Aden, N. & S. Nigeria, F.W. Africa, British India, and in course of transit, Germany, France, and Austria Hungary (Trade of the United Kingdom, i. 1910, p. 120).

Senegal and Kordofan are the most important centres of the trade in gum arabic; the principal markets, Antwerp, Barcelona, Bordeaux, Hamburg, Havre, Liverpool, London, Marseilles, Melbourne, New York and Trieste. Confectioners are probably the largest users.

May be propagated by seed, the special requirements being sandy, well-drained soil and a dry, hot climate. According to Dalziel it is common in the Northern Provinces, but is there rarely more than a shrub or small tree (Kew Bull. 1910, p. 135; *q.v.* for further particulars of this and other species yielding "Falli" and "Marrua" gum in N. Nigeria).

Large quantities of the best gum arabic are obtainable in Bornu, (Lugard, Col. Rep. Ann. No. 516, 1907, p. 81) where large forests are found, and in the Northern Hausa States, though very little of the gum is collected (Wallace, l.c. No. 551, 1907, p. 75); the bulk of the product comes from N. Nigeria (Thompson, Col. Rep. Ann. No. 512, 1906, p. 20), and no Gum Arabic is collected within the limits of S. Nigeria (*idem*, l.c. No. 554, 1908, p. 40, and Misc. No. 51, 1908, p. 40).

Ref.—"*Acacia Senegal*," in Med. Pl. Bentley & Trimen, ii. No. 94, 8 pages (Churchill & Son, London, 1880).——"*Acacia Senegal*" in Med. Pflanzen, Köhler, i. 5 pages.——"*Acacia Senegal*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 55–60.——"*Acacia Verek*," in Toxicologie Afric. Trop. Franç.; De Rochebrune, ii. fasc. 1 (1898), pp. 175–177.——"Gomme du Sénégal," Heckel, in Ann. L'Inst. Col. Marseille, vi. 1899, pp. 18–29.——"*Acacia Senegal*," Watt, in Agric. Ledger, No. 2, 1902, pp. 74–78.——"Hashab tree (*Acacia Verek*)," Muriel in Indian Forester, xxviii. 1902, pp. 53–55 illust.——"*Acacia Senegal*," in Les Veg. Utiles de l'Afr. Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 57–60 (Challamel, Paris, 1907); "Egyptian Gum Arabic Trade," in Bd. of Trade Journ. April 4th, 1907, pp. 12–13.—"*Acacia Senegal*," in Bull. Imp. Inst. vi. 1908, pp. 29–60; Northern Nigeria Gums, pp. 47–49, with analyses of samples from Bassa, Borgu, Geidam, Kano, and Bornu, p. 48.——"*Acacia Senegal*," in Comm. Prod. India, Watt, pp. 16–18.

Acacia Seyal, *Delile*; Fl. Trop. Afr. II. p. 351.

Ill.—Delile, Egypte, t. 52, f. 2; Hayne, Darst. Beschr. Gewächse, x. t. 30; Guimpel, Abbild. Beschr. t. 150; Nees von Esenbeck, Plant. Med. Düsseld. t. 336; Wagner, Pharm. Medic. Bot. t. 179; Berg. & Schmidt, Darst. & Beschr. Pharm. i. t. 6d; Ralph, Ic. Carp. t. 3, f. 7; Schweinf. in Linneae, xxxv. tt. 11–14 (*A. fistula*); Engl. & Prantl, Pflan. iii. pt. 3, f. 66 (var. *fistula*); Engl. Pflan. Ost. Afr. t. 20, f. G (pod); De Rochebrune, Toxicol. Afric. ii. fasc. 2, p. 201, ff. 174–175 (pod & seed); Tropenpfl. 1901, p. 24 (habit); Sim, For. Fl. & For. Res. Port. E. Afr. t. 35, f. B; Volkens, Notizblatt, App. xxii. No. 3, 1910, p. 88, f. 43; Engl. & Drude, Veg. Erde, ix. f. 65 (var. *fistula*, branch with spines); f. 242 (habit).

Vernac. names.—Dussa (Katagum, *Dalziel*); Karumga (Bornu, Bull. Imp. Inst. 1910, p. 357); Talha (Arabic, Bull. Imp. Inst. l.c.); M'Salla; (Nile region, *Grant*); [M'Salla (Unyamesi); Seyal (Arabic); Talch (Sudan); Mgunga, Nyika, M'piga-Kolubu (Mrima); Sofar (Arabic, *De Rochebrune*]; Talh abiad, Soffar (Arabic [Kordofan], Bagu (Hameg [Kordofan], *Muriel*, No. $\frac{L}{155}$, Herb. Kew).—Suakim, Talca or Talka Gum (*Moloney*, For. W. Afr. p. 345); Talh or Talha gum (Bull. Imp. Inst. vi. 1908, p. 37; Col. Rep. Misc., No. 63, 1909, p. 143, 144); Gomme Sennari, Gomme de Sennaar, Shittim or Shittar Wood.

Kouka [or Kuka], N. Nigeria (Fl. Trop. Afr. ii. p. 351).

Bure, near Lake Chad, N. Nigeria (Elliott, No. 111, 1904, Herb. Kew); Katagum (Dalziel, No. 47, Herb. Kew); Gorgoram, N. Nigeria (Elliott, No. 163, 1904, Herb. Kew).

Yields Suakim, Talca, Talha or Talki gum arabic. This gum in commerce is usually classed as an inferior sort, but it appears to be one of the principal Acacias yielding gum in the Nile region.

The gum of M'Salla, according to Grant (Trans. Linn. Soc. xxix. p. 68), is of a bright amber colour, flows freely from all wounds, and as it dries becomes white and brittle like dried crumbs of bread.

"Karumga" gum from Bornu province has been valued in London (Jan. 1910) at 30*s.* per cwt. for "large grade," and 19*s.* per cwt. for "medium" and "small" grades—all unfit for use in confectionery owing to the presence of dark-coloured fragments, which gave a rather marked colour and taste to mucilage made from it; but the relatively high viscosity and strong adhesive power of its solutions made it suitable for other industrial purposes (Bull. Imp. Inst. 1910, p. 359).

For general particulars on the trade, &c., see *A. Senegal.*

Elephants feed on the pods—knocking the trees down to get at them—in the Nile region (Grant, l.c.).

The tree is common north of the Equator in Tropical Africa.

According to Vogel (Fl. Trop. Afr. ii. p. 351), there are woods of enormous extent between 12° & 16° N., occurring in isolated examples in dry, stony (not in sandy) places from the Black Mountains (29° N.) to Kuka (Bornu). Forests of it exist in 9° to 10° N. on the left bank of the Nile, where the trees are the size of a large apple tree, flowering and fruiting in March (Grant, l.c.); characteristic of black cotton soils throughout all parts of the [Egyptian] Sudan (Muriel, Indian Forester, xxviii. 1902, p. 48). The tree is a prominent feature between Nimale and Gondokoro, Madi and Bari countries, and it is remarkable for the fragrance of its flowers (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 34).

Acacia stenocarpa, Hochst, Fl. Trop. Afr. ii. p. 351, also yields a "gum arabic," known like the present species as "Suakim," "Talca" or "Talha" gum (see Flückiger & Hanbury, Pharmacog. p. 234), but there are no specimens at Kew from Nigeria.

Ref.—"Gomme du Senegal," Heckel, in Ann. L'Inst. Col. Marseille, vi. 1899: Gommes, Résines, pp. 18–29 (in part).——"*Acacia Seyal*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 2 (1899), pp. 201–202. ——"*Acacia fistula*," l.c. pp. 202–204.——"*Acacia Seyal*," in Les Vég. Utiles de L'Afr. Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 60–64.

Acacia Sieberiana, *DC.*; Fl. Trop. Afr. II. p. 347.

Ill.—De Rochebrune, Toxicol. Afric. ii. fasc. 2, p. 207, ff. 182–183 (pod & seed).

Vernac. names.—Sie (Oloke Meji, *Foster*); Katalabu (Bornu, Bull. Imp. Inst. 1910, p. 357); Mussongue or Mussonde (Pungo Andongo, *Welwitsch*); M'Salla (Madi, *Grant*); Mussongue (Angola, *De Wildeman*); Sing, Zing, Singdour (Ouoloff, *De Rochebrune*); Baggui, (Bambara, *Chevalier*); Alouk or Alouki (Timene, *Chevalier*).

Oloke Meji (Foster, No. 15, 1906, Herb. Kew); Yo, N. Bornu (Elliott, No. 151, 1904, Herb. Kew) Katagum (Dalziel, No. 300, 1908, Herb. Kew).

Yields a gum, of an inferior quality to that of *A. Senegal*, but possibly saleable at a remunerative price (Col. Rep. Misc. No. 63, 1909, p. 154). For general particulars of trade, &c., see *A. Senegal.*

Bark used for making a coarse cordage, and pods used for tanning (Moloney, For. W. Afr. p. 342).

Ropes are made of the bark in Madi (Grant, Trans. Linn. Soc. xxix. p. 67).

Flowers richly scented, appearing in April (18° N.) (l.c.).

Ref.—"*Acacia Sieberiana*," in Toxicologie Africaine, De Rochebrune, ii. fasc. 2 (1899), pp. 207-208.——"*Acacia Sieberiana*," in

Pl. Util. du Congo, De Wildeman, ii. fasc. 1, pp. 108–109 (Spineux & Co., Bruxelles, 1906).——"*Acacia Sieberiana*," in Les. Vég. Utiles, Afr. Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 64–67.

The following general works on Acacia gums may also be consulted.

"Acacia [Gum Arabic]": A gummy exudation from *Acacia Verek*, and other species of Acacia, in An Ephemeris of Materia Medica &c. Squib, i. pp. 249–252 (Brooklyn, N.Y. 1883).——"Gomme Arabic," in Les Pl. Industrielles, Heuzé, iv. pp. 258–266.——The Indian Acacias, Watt, in Agric. Ledger, No. 2, 1902, pp. 57–86.——"Soluble gums," in Col. Rep. Misc. No. 63, 1909, pp. 142–161.——"Gums from N. Nigeria," in Bull. Imp. Inst. viii. 1910, pp. 352–365.——"Notes on the Botanical Resources of Yola Province, N. Nigeria," Dalziel in Kew Bull. 1910, "Gum," pp. 134–136 ; *Ibid.* in Bull. Imp. Inst. l.c. pp. 353–355.——"Gommiers d'Afrique," in Pl. Gommes, Résines, De Cordemoy, pp. 56–99.

ALBIZZIA, Durazz.

Albizzia anthelmintica, *A. Brongn.*; Fl. Trop. Afr. II. p. 357.

Ill.—Schweinf. Reliq. Kotschyanae, t. 4 (*A. floribunda*) ; Ann. Sc. Nat. Paris, Series 4, xiv. t. 14; Engl. Pflan. Ost. Afr. t. 21, f. G (pod & seed) ; Tropenpfl. 1901, p. 333 ; Engl. & Drude, Veg. Erde, ix. f. 468 (after Warburg in Tropenpfl.).

Vernac. names.—M'tondo (Zambesi, *Meller*) ; Besenna, or Mesenna (Abyssinia, *Moloney*) ; Mussana or Mousenna (Abyssinia, *Calvert*) ; Ta-kir-ni (Soudan, *Muriel*, *Broun*); Ol-wukutaa (Maisai-land, *Hollis*) ; Same, Deda, Ngorokolok (F.W. Africa, *Chevalier*).

Tropical Africa extending from Abyssinia through the Sudan to Zambesi land.

Bark, powdered and mixed with honey, used by the Abyssinians as an anthelmintic (Calvert, Mus. Kew).

Wood very hard, used for canoe making in the Zambesi region, where the tree is one of the largest, attaining a diameter of 4 ft. (Meller, Herb. Kew). Similar characters and uses of the wood, probably originating from the above source, are mentioned in Moloney, For. W. Afr. p. 346 ; Fl. Trop. Afr. l.c. ; etc.

The tree is found in Ngamiland at the foot of hills up to 3200 ft. above sea level (Lugard, Herb. Kew).

There appear to be no Nigerian specimens of this tree at Kew, but the wide distribution, large size and apparently useful timber make it worthy of mention.

Ref.—"*Albizzia anthelmintica*," in Les Végétaux Utiles de l'Afrique Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 82–84.

Albizzia Brownei, *Walp.* ; Fl. Trop. Afr. II. p. 362.

Ill.—De Candolle, Mem. Leg. t. 65 (*Inga Zygia*).

Vernac. names.—Ayinre- or Ainre-Bona-Bona (Lagos, Abeokuta, *Thompson*, *Punch*) ; Abontosa ? (Ibo, *Thompson*); Ikpa wudu Utantan ? (Benin, *Thompson*) ; Isaga ; Bobai (Cameroons, *Büsgen*) ; Kabumba (Lukafu, *De Wildeman*); Muange (Congo, *De Wildeman*) ; Nongo (Uganda, *Dawe*).

Abeokuta. Lagos ; Mamu Forests ; Calabar River ; Okuni, Cross River.

The leaves, bark, and roots are used medicinally in S. Nigeria (Thompson, List of For. Trees, S. Nigeria, 1910, p. 4).

Yields an insoluble gum of some value. Samples from Uganda, consisting of irregular dark brown tears and aggregations of tears, varying in weight from ½ lb. to ¼ oz. or less, and in most cases containing woody impurities, have been stated to be practically unsaleable, though gum of a similar type when light-coloured could be sold at low rates in London (Col. Rep. Misc. No. 63, 1909, pp. 164, 165).

The wood—sapwood white, heartwood dark brown—is very hard and durable; planks are often sold in Lagos as "Iroko" (Punch, Herb. Kew). A good timber fit for local use, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 184), sold locally in S. Nigeria, where it is used for making doors, beams and planks (List of For. Trees, S. Nigeria, 1910, p. 4). Suitable for building purposes (De Wildeman, Pl. Util. Congo, Art. xxvi. 1904, p. 363).

The tree is recorded on Herbarium specimens at Kew as a large forest tree at Abeokuta (Punch); large tree on river banks, near the confluence [Niger & Benue] (Barter); tree 30 ft. high, Old Calabar River (Mann); large tree with gum exuding from trunk at Okuni (Holland); a tree about 30 ft. on laterite soil in open country, Sierra Leone (Scott Elliot); tree 30–40 ft. N.W. Ankole at 3500 ft., in Mabira Forest at 4500 ft. above sea-level, and common throughout Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 44).

Ref.—"Gum of *Albizzia Brownei*," Uganda, in Col. Rep. Misc. No. 63, 1909, pp. 164–165.——"*Albizzia Brownei*," in "Einige Nutzhölzer Kameruns," Harms, Notizblatt, Bot. Gart. Berlin, App. xxi. No. 2, 1911, pp. 16–18.

Albizzia fastigiata, *E. Mey.*; Fl. Trop. Afr. II. p. 361.

Ill.—Engl. Pflan. Ost. Afr. t. 21, ff. H–J (part of flower & pod); Wood, Natal Pl. i. t. 27; Sim. For. Fl. Cape Col. t. 62; Sim. For. Fl. & For. Res. Port. E. Afr. t. 58; Engl. & Drude, Veg. Erde, ix. f. 290 (habit).

Vernac. names.—Owowe (Benin, *Thompson*); Ayinre ogo (Oloke Meji, *Foster*); Ayanre (Lagos, *MacGregor*, No. 40, Herb. Kew, var. *glabra*); Ayinretta or Ayinreta (Lagos, *Thompson*, *Punch*); Papan (Gold Coast, *Ferguson*); Chikwani (Nyasaland, *Purves*); Um-Llandhloti, or Um-Llandoti Nebelele (Kafir, *Sim*, *Wood*); Apaon Bagroo River, *Mann*, *Moloney*); [Goâne (Tronga, Lorenço Marques); Mbezwa (Gaza); Mocusu or O'heso (M'chopes, Zuralla); Maranga (Echuabo, Quelimane) *Sim*]; Pran pran (Ivory Coast, *Chevalier*).—Flatcrown.

Lagos; Oloke Meji; Mt. Patti, N. Nigeria; widely distributed in W. Africa; known also from Natal.

Yields a gum somewhat similar to gum arabic (Chevalier, Comptes Rendus, 7th March, 1910, p. 625); exudes an insoluble gum according to Foster (No. 128, 1901, Herb. Kew).

A native sauce is prepared from the seeds by maceration in Golungo Alto (Fl. Trop. Afr. ii. p. 362; Moloney, For. W. Afr. p. 346).

Wood soft, used for naves of wheels (Moloney, l.c.), yokes, for doors and for general purposes; weight per cubic foot 35–40 lb. (Sim, For. Fl. Cape Col. p. 214; For. Fl. & For. Res. Port. E. Afr. p. 114), or 38–67 lbs. per cubic ft. (Unwin, Tech. Rep. & Sci. Papers Imp. Inst. p. 291); yields good timber, fit for local use (Thompson, Col. Rep. Misc. No. 66, 1910, p. 184). A specimen in the Museum at Kew has specific gravity 0·6237 = 39 lbs. per cubic foot.

Often found useless for timber purposes (Wood & Evans, Natal, Pl. i. p. 24), as the tree is very liable to attack by white ants, and may be hollow in the centre.

The timber is burnt by the natives of Lagos for the sake of the ash (Foster, Herb. Kew).

Grows very rapidly on old farms (Thompson, List of For. Trees, S. Nigeria, 1910, p. 6).

Albizzia Lebbek, *Benth.*; Fl. Trop. Afr. II. p. 358.

Ill.—Jacq. Ic. Rar. i. t. 198 (*Mimosa speciosa*); Tuss. Ant. iv. t. 29 (*Acacia lebbec*); Ralph, Ic. Carp. t. 5, f. 1; Bedd. Fl. Sylv. t. 53; Vidal, Fl. For. Filip. t. 45E (pod & parts of flower); Ann. Inst. Col. Marseille, vi. 1899, p. 36, ff. 4–5 (*Acacia Lebbek*); Contr. U. S. Nat. Herb. viii. pt. 2, 1903, t. 15 (*Acacia amarilla*); Stone, Timb. Comm. t. 5. f. 40 (trans. sec. of wood); Pobeguin, Fl. Guin. Franç. t. 71 (habit); De Wildeman. Etude Fl. Bas. Congo ii. t. 3 (pods); Talbot, For. Fl. Bombay, i. ff. 280–282.

Vernac. names.—Sacr (F. W. Africa, *Chevalier*); Lubach (Khartoum, *Grant*); Laebach (Arabic, *Moloney*); Siris (India, *Watt*, *King*, *Prain*).—Woman's tongue (so named because the pods are always rattling), Egyptian Sensitive or Oriental Ebony, East Indian Walnut, Kokoh or Kokka (Rangoon).

Wild in Tropical Asia—India, Ceylon, Burma &c.; distributed to Tropical Africa; found also in Malaya, China, N. Australia, &c., and cultivated in many tropical countries.

The bark is used in Madras for tanning fishing-nets (Watt, Comm. Prod. India, p. 416).

The leaves and twigs are given as fodder to camels. The wood is used for sugar-cane crushers, oil mills, furniture, well-curbs, wheelwork, and boats in India, also for house-posts and various building purposes in the Andamans (Gamble, Man. Ind. Timb. p. 304); for agricultural and industrial instruments and appliances, picture frames, &c. (Watt, l.c.); recommended for paving blocks; price in Rangoon (1900) for 100 sq. metres [7750 blocks], 1043 francs (Mus. Kew); weight, 42–61 lbs. per cubic ft.

It comes into London from the Andamans, in logs up to 50 ft. long with 3 ft. siding, and the "burrs" fetch 10 to 20 times the value of ordinary wood (Gamble, l.c.).

Easily propagated by seed or cuttings; grows rapidly, very handsome when in flower, and is well adapted, with judicious pruning, to forming avenues. The tree is under cultivation in the Oloke Meji Reserve (Col. Rep. Ann. No. 630, 1909, p. 14), and is being planted extensively as a shade tree in the Colony (Report, Bot. Gdn. Oloke-Meji, 1907).

Ref.—East Indian Walnut, Handbook No. 22, 1893, Imp. Inst. Series, pp. 1–2.——"*Acacia Lebbek*," Heckel, in Annales l'Inst. Col. Marseille, vi. 1899: Gommes, Résines, pp. 35–38.——The Lebbek or Siris Tree, Fairchild, U.S. Dept. Agric. Div. of Botany, Circ. No. 23, 1900, pp. 1–4.——"Le Lebbek," Fairchild, in Bull. Soc. Nat. D'Acclimatation, de France, 1901, pp. 84–86.——"*Albizzia Lebbek*," in Man. Ind. Timb. Gamble, pp. 303–304.——"East Indian Walnut," in Tech. Rep. & Sci. Papers, Imp. Inst. Part 1 (1903), pp. 303–304. ——"East Indian Walnut, *Albizzia Lebbek*," in The Timbers of

Commerce, Stone, pp. 74–75.——"*Albizzia Lebbek*," in Les Végétaux Utiles de L'Afrique Trop. Franç. Chevalier, Perrot et Gérard, iii. pp. 70–72.

Albizzia rhombifolia, *Benth.*; Fl. Trop. Afr. II. p. 358.

Vernac. names.—Ayinre ogo or Ayinre Langara (Benin, *Thompson*); Bekili (Golo, Sudan, *Broun*); Pranpran (Ivory Coast, *Chevalier*).

W. Africa from Senegambia to Nigeria, known also from the Nile region.

A good timber used for making boats, Golo (Broun, Herb. Kew); used for firewood in S. Nigeria (Thompson, List of For. Trees, S. Nigeria, 1910, p. 4); suitable for joinery and carpentry work; density 0·589 – 0·713 (Chevalier, Les Pl. Veg. Util. L'Afriq. Trop. Franç. Fasc. v. 1909, pp. 277, 281).

Occurs in the tropical rain forests of S. Nigeria and the Gold Coast (Col. Rep. Misc. No. 66, 1910, p. 175).

PITHECOLOBIUM, Mart.

Pithecolobium altissimum, *Oliv.* Fl. Trop. Afr. II. p. 364.

Aboh; Niger; Cameroons.

A tree 40–50 ft. high on the banks of the Nun [Niger] river, (Mann, Herb. Kew).

Pods used for dyeing and making ink, Abo (Barter, Mus. Kew).

The wood is hard and close grained, specific gravity 0·7741 = 48 lbs. per cubic foot, white when freshly cut, darkening on exposure to a rich brown colour, bark greyish-brown, thin (1 lin.), finely striated on the inner surface, the lines showing through in places on the outside, where the rough outer bark peels off.

Ref.—"*Pithecolobium altissimum*," in Einige Nutzhölzer Kameruns, Harms, Notizbl. Bot. Gart. Berlin, App. xxi. No. 2, 1911, pp. 14–15.

ENTEROLOBIUM, Mart.

Enterolobium Saman, *Prain*, Journ. Asiat. Soc. Bengal, lxvi. p. 252. [*Pithecolobium Saman*, Benth. in Hook. Lond. Journ. Bot. iii. p. 216.]

A large tree, up to 60 ft. high; branches spreading. Leaves pinnate, 4–6 in. long, pubescent; Pinnae 2–6 pairs, 2–3 in. long; leaflets 2–8 pairs, ovate-oblong or sub-orbiculate, somewhat coriaceous, pubescent on the underside, the larger ones 1½ in. long. Flowers in dense heads; Calyx funnel-shaped; Corolla funnel-shaped, pink, silky-villose. Pods about 7 in. long, ¾ in. wide, 2 lin. thick, firm, straight, indehiscent, snapping readily between each seed, mesocarp spongy, hardening as the pod dries. Seeds about 20 in each pod; hard, shining, dark brown, with an areole well defined on both sides, ellipsoidal, major axis ½ in., minor axes ¼ in. and ⅛ in.

Ill.—Jacq. Fragm. Bot. t. 9 (*Mimosa Saman*); Ralph, Ic. Carp. t. 2, f. 4; Preuss, Exped. Cent. und Südamer. p. 341 (habit); Trop. Agric. Ceylon, 1905, p. 161 (*Inga Saman*, habit, well grown); p. 162, (habit, effects of bad treatment); West India Comm. Circ. xx. 1905, p. 148 (habit, of branching); Gard. Chron. 3rd Sept. 1910, p. 176, f. 69; Queensland Agric. Journ. xxv. 1910, t. 20 (habit), p. 244 (from an old engraving); Macmillan, Trop. Gard. Pl. pp. 371, 372 (habit).

Vernac. names.—Tamia-caspi (Peru, *Spruce*); Zamang (Venezuela, *Safford*).—Deers Vanilla (Peru, *Spruce*), Saman, Guango, Rain Tree, Monkey Pod.

Native of Tropical America; introduced by cultivation to W. Africa, the West Indies, India, &c.

The pods are good fodder for stock, and the tree is grown for this purpose in the West Indies, India and other places.

The wood is light—26-36 lbs. per cubic ft. (Gamble, Man. Ind. Timb. 310); good for all purposes except in exposed situations (West Ind. Bull. ix. 1909, p. 305) unless well tarred; makes good furniture and flooring (Bull. Dept. Agric. Jamaica, iii. 1905, p. 169); though according to Gamble (l.c.) the wood in India has been found nearly worthless either as timber or fuel.

Propagated by seed; grows rapidly in almost any situation. Recommended with *Casuarina* for reclaiming the land along the sea-shore on the Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 7); cultivated as a decorative and shade tree, Old Calabar (Rep. Bot. Gdn. Old Calabar, 1900-01), used as a shade tree for cocoa and Guinea grass (*Panicum maximum*) in Trinidad and Jamaica, where it is found the Guinea grass grows better when shaded by this tree, than when grown in the open (Bull. Misc. Inf. Roy. Bot. Gdns. Trinidad, 1901, p. 347). The tree is deciduous, and the leaves, together with the flowers, pods and seeds, supply a good proportion of nitrogenous manure.

Some currency has been given to the statement that this tree affords a good water supply in dry regions, but this is without foundation and the so-called rain is said to be caused by "multitudes of cicadas sucking the juices of the tender young branches and leaves, and squirting forth slender streams of limpid fluid," a phenomenon which does not appear to have occurred outside Peru.

Ref.—"Rain Tree," in Kew Report, 1878, pp. 46-47.——"The Rain Tree of Moyobamba," Thiselton-Dyer, in Nature, xvii. 1878, pp. 349-350.——"Shade Trees," in Bull. Roy. Bot. Gardens, Trinidad, July 1901, pp. 347-349.——"Guango, (*Pithecolobium Saman*)," in Bull. Dept. Agric. Jamaica, i. 1903, pp. 247-248, with analyses of seeds and pods.——*Ibid.* in West Indian Bull. v. No. 2, 1904, pp. 112-115, with analyses of seeds and pods.——*Pithecolobium Saman* (Uango, Rain tree)," Pl. Util. Congo, De Wildeman, Art. xxxi. pp 550-554, with analyses.——"The Rain Tree of Peru (*Pithecolobium Saman*)," in Queensland Agric. Journ. xxv. 1910, pp. 243-245.

ROSACEAE.

CHRYSOBALANUS, Linn.

Chrysobalanus Icaco, *Linn.*; Fl. Trop. Afr. II. p. 365.

Ill.—Plumier, Ic. Burm. t. 158; Jacq. Icon. Select. Stirp. Am. t. 94; Browne, Jamaica, t. 17, f. 5; Dict. Sc. Nat. t. 236; Desc. Ant. ii. t. 84; Lam. Encycl. t.42 8, f. 1; Tuss. Ant. iv. t. 31; Schnizlein, Ic. t. 274; Spach, Suites (Hist. Nat. des Vegetaux) t. 5, f. 4; Gard. Chron. May 6th 1871, p. 586; Sargent, Silva, N. America, iv. t. 148; Contr. U.S. Nat. Herb. viii. t. 26.

Vernac. names.—Varach (Gambia, *Blackburn*, *Allegre*); Eschimno (Loanda, *Gossweiler*); Apuru (Fr. Guiana, *Heckel*); Icaquier (Fr. Guiana, *Heckel*).—Cocoa or Coco Plum, Coco Plumb Tree (*Tussac*), Icaquier d'Amerique (*Tussac*), Prune-coton, Prune de l'anse (*Heckel*), Fat Pork Tree (*Hughes*).

Lagos : Nun (Niger) river ; Senegambia to Angola, and found in Tropical America.

The fruit is edible, somewhat like a Victoria plum in size and general appearance, variable in colour—white, purple, red or yellow, with spongy pulp ; in the West Indies they are eaten when fresh or preserved ; in Angola they are eaten after being dried (Gossweiler, Herb. Kew).

The root, bark and leaves are astringent and used in cases of diarrhœa and for various medicinal purposes in French Guiana (Heckel, Ann. Inst. Col. Marseille, 1907, p. 139).

The seeds contain an oil ; they are used as candles on the Gambia (Allegre, Mus. Kew).

The wood is hard, strong, heavy and close-grained ; specific gravity of the absolutely dry wood is 0·7709 (Sargent, Silva N. America, iv. p. 4) ; weight about 48 lbs. per cubic foot.

May be propagated by seeds ; grows chiefly in maritime or swampy situations. At Ambriz it grows about 1 ft. high in large circular patches on the sea-shore ; 4–6 ft. high, in large clumps and belts slightly further inland, but never grows beyond reach of the sea-spray (Monteiro, Herb. Kew).

Ref.—" *Chrysobalanus Icaco* : Cocoa Plum," in Silva of N. America, Sargent, iv. pp. 3–5.

PARINARIUM, Juss.

Parinarium curatellaefolium, *Planch.* ; Fl. Trop. Afr. II. p. 368.

Ill.—Volkens, Notizblatt, App. xxii. No. 1, 1909, p. 8, f. 2 ; Engl. & Drude, Veg. Erde, ix. f. 671.

Vernac. names.—Idofun (Lagos, *MacGregor*) ; Abo or Abo-Idofun (Yoruba, *Thompson*) ; Kobenoki (Nupe, *Barter*) ; Munabiliko (Uganda, *Dawe*).

Yoruba ; Lagos ; Nupe ; Kontagora ; Mt. Patti, Lokoja, and widely distributed in Tropical Africa.

Fruit about the size of a Victoria plum, mealy when ripe, but one of the best of native fruits, Nupe (Barter) ; S. Nigeria (Thompson).

Bark used in Agbo (MacGregor, Herb. Kew).

The wood is used by the natives in S. Nigeria for building farm-sheds (Thompson, List of For. Trees, S. Nig. 1910, p. 8) ; of no value for export (Bull. Imp. Inst. 1908, p. 231).

Grows 12 ft. high in Nupe, where it delights in high rocky situations (Barter) ; shrub or tree in open bush, Kontagora (Dalziel) ; low tree on Mt. Patti (Elliott) ; 25 ft. high on the plains Sierra Leone (Scott Elliot) (Herb. Kew).

Parinarium excelsum, *Sabine* ; Fl. Trop. Afr. II. p. 367.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 62.

Vernac. names.—Abbis (Timani, *Unwin*) : Ndauwi or Ndawi Badji (Mendi, *Unwin*) ; Mubula (Uganda, *Dawe*) ; Songue (French Guinea, *Farmar*).—Gray or rough-skinned plum.

West Africa—Senegambia to the Bagroo River and in Uganda.

Fruit edible, but the pulp is dry, small in quantity and insipid taste (Fl. Trop. Afr. l.c.).

A useful timber tree, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 44) ; one of the commonest trees in W. Ankole Forest, altitude 5000 ft., where it attains a height of 90 ft. and girth 10–13 ft. (Dawe, Herb. Kew) ; used for building purposes in Sierra Leone

(Unwin, Rep. For. Sierra Leone, 1909, p. 8); recommended for cabinet work, joinery, constructional work and domestic utensils (De Wildeman, Pl. Util. Congo, ii. Art. vi. 1906, p. 139); useful for furniture locally, though not ornamental and of no value for export; weight 56 lbs. per cubic foot (Bull. Imp. Inst. 1908, p. 231).

The ashes of the wood and bark are used on the Congo, in the preparation of skins (De Wildeman, l.c.).

Ref.—"*Parinarium excelsum*," in Pl. Util. Congo, De Wildeman, ii. Fasc. 1, 1906, pp. 138–140.

Parinarium macrophyllum, *Sabine*; Fl. Trop. Afr. II. p. 369.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 61 (*P. senegalense*).

Vernac. names.—Gawasa (Katagum, *Dalziel*).—Ginger-bread plum.

Katagum. Sierra Leone; Senegambia; St. Thomas.

Fruit about the size of a goose egg; edible, Katagum (Dalziel, Herb. Kew); eaten in Sierra Leone (Smythe, Herb. Kew).

Wood used for planks, S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 8).

Parinarium Mobola, *Oliv.*; Fl. Trop. Afr. II. p. 368.

Ill.—Warburg, Kumene Exped, p 71 (habit); Journ. Linn. Soc. xxxvii. 1906 t. 18, ff. 3, 4 (habit); Rhodesia Agric. Journ. viii. 1910, p. 212 (habit); Engl. & Drude, Veg. Erde, ix. f. 369 (habit).

The Mola or Mobola Plum.

Yoruba (Thompson, Rep. Meko & Shaki Dist. 1910, p. 4).

Fruit edible, flavour like strawberry (Kirk), somewhat the taste of a rich date, but mealy and tasteless if not quite ripe (Dawe).

The kernels contain an oil; in 1876 they were tried on the Liverpool Market as an "oil-seed," coming from Liberia (Samuelson, Mus. Kew).

Timber good, Nyasaland (Cameron, Herb. Kew); used for planks S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 8).

Parinarium polyandrum, *Benth.*; Fl. Trop. Afr. II. p. 370.

Vernac. names.—Ako Idofun (Yoruba, *Thompson*); Abaddina or Attadina (Nupe, *Barter*); Chebweri (Shire Dist. Nyasaland, *Johnston*).

Lagos; Lokoja; Kontagora; Attah on the Quorra; Nupe.

Fruit resembles a small peach, scarcely edible (Barter, Herb. Kew); black, plum-like, fruiting in March at Lokoja (Dalziel, Herb. Kew).

The root, dried and powdered, is used as a cure for syphilis in the Shire District (Johnston, Mus. Kew).

The wood is largely used by the native smiths (Nupe) for charcoal making, for which purpose they consider it the best wood (Barter, l.c.); used by the Natives of S. Nigeria for building farm-houses (Thompson, List of For. Trees, S. Nig. 1910, p. 8).

Grows as a small stout tree 12 to 20 ft. high in Nupe (Barter).

Parinarium robustum, *Oliv.*; Fl. Trop. Afr. II. p. 370.

Vernac. names.—Aghaghe (Lagos, *Millen*); Bumpago (Gold Coast, *Evans*); Aroba or Oroba (Mbonoi, Ivory Coast, *Chevalier*).

Banks of the Nun [Niger] river; where, according to Mann (No. 481, Herb. Kew), it grows 40 ft. high, and on the Gold Coast a large timber tree 80 ft. high (Evans, Mus. Kew): density of wood 0·957 (Chevalier, Les Veg. Util. L'Afriq. Trop. Franç. Fasc. v. 1909, pp. 281, 225).

RHIZOPHOREAE.

RHIZOPHORA, Linn.

Rhizophora racemosa, *E. Mey*; Fl. Trop. Afr. II. p. 408.

Ill.—Arb. Amazon (1900) t. 15 (*R. Mangle*, var. *racemosa*, habit).

Vernac names.—Egba (Yoruba, *Thompson*); Egba or Igi-Egba (Lagos, *Dawodu*); Manko, Mangi (Gambia, *Dudgeon*); Ende, Koghiabera, Ntagué (Ivory Coast, *Chevalier*).——Red Mangrove.

Brass (Barter, No. 1850, Herb. Kew); Akassa (Barter, No. 2078, Herb. Kew); Lagos (Millen, No. 137; Dawodu, No. 329); Banks of the Nun (Mann, No. 492, Herb. Kew); throughout West Africa extending to Angola and Loanda, S.W. Africa, along the banks of rivers up to the limit of tidal influence; and occurring under similar conditions in tropical America and the West Indies.

The American Mangrove (*Rhizophora Mangle*, Linn.), may also extend to West Africa, but there are no satisfactory specimens at Kew to make certain of this point.

The other Old World Mangroves (*Rhizophora mucronata*, Lam.; Fl. Trop. Afr. ii. p. 407, and *Ceriops Candolleana*, Arn.; Fl. Trop. Afr. ii. p. 409—known in Malaya as "Tengah") appear to be confined in Africa to the east coast.

The conditions of growth, general habit and uses of all three, however, are much the same.

The bark contains tannin, but the quality and action is somewhat uncertain, and no demand has arisen for the West African product.

Efforts to create a trade in the bark from West Africa have invariably failed, owing usually to the low percentage of tannin, poor and uncertain quality, and unremunerative rates. A promising industry in Senegal was stopped by law, because the destruction of the Mangrove forests was thereby threatened.

Bark from Sierra Leone has been found to contain 18 per cent. of tannin, Gambia 25 per cent., Gold Coast 29 per cent. (Bull. Imp. Inst. 1907, pp. 347, 348), Cameroons 20 to 27 per cent.—calculated on air dried bark containing from 10·6 to 14·6 per cent. of moisture (l.c. 1906, p. 66), Loanda 15·7 per cent.—bark from old wood (Cons. Rep. Ann. No. 3478, 1905, p. 4), and from S. Nigeria 16·8 per cent. (Gov. Gaz. S. Nig. 21st June, 1911, Suppl. p. 10).

Good bark should contain 45 per cent. and upwards of tannin, and other characters being equal this would probably realise, at the present time, not more than from £4 to £6 per ton.

Rhizophora mucronata is the best species for the production of suitable tanning bark, and the commercial supplies come chiefly from East Africa, Zanzibar and Asiatic sources.

The bark soon deteriorates if allowed to get wet or fermented after gathering, and the unsatisfactory condition of West African bark may be due to these causes. The difference in the species, however, appears to be the primary cause of failure, as samples from British Guiana (Bull. Imp. Inst. 1907, p. 346), Jamaica, Bahama and other West Indian Islands (Kew Bull. 1892, p. 227; Agric. News, Barbados, v. 1906, p. 252), have met with the same fate as those from West Africa, and no successful contributions have come from America, where *R. racemosa* and *R. Mangle* predominate.

The best mangrove bark or extract is not so acceptable to tanners as oak bark, Valonia, Quebracha, Mimosa bark, and other well-established tanning materials. The principal objection lies in the deep red colour it imparts to the leather and it is only satisfactory when used in combination with the better class substances.

Roots of the Mangrove mixed with "divi-divi" (*Caesalpinia coriaria*) have been used at a local tannery in Jamaica (Kew Bull. 1892, p. 229).

The bark of the West Indian and S. American Mangrove is used locally as a wound remedy and febrifuge, and it has been recommended as a specific for leprosy (Merck's Ann. Rep. 1905, p. 175).

The wood is hard and durable; the specific gravity of a specimen in the Kew Museum (collected by Mann in 1861) is 0·969 = 60·5 lbs. per cubic foot. According to Chevalier, the density is 1·093 (Les Veg. Util. L'Afriq. Trop. Franç. fasc. v. p. 224). Used for building houses in the Western Province (Dawodu, Herb. Kew) and in parts of S. Nigeria near swamps for piles, and fuel. It has been recommended for paving blocks and railway sleepers. Logs have been sent to the Hamburg market, but beyond the interest they created as possible piles and beams for mine-shafts, no demand for them appears to have arisen (Baillaud, Journ. D'Agric. Tropicale, 1904, p. 201).

Ref.—"*Rhizophora Mangle*," Warming, in Engler, Bot. Jahrb. iv. 1883, pp. 519–548.——"Mangrove Bark and Extract," in Kew Bull. 1892, pp. 227–232.——"*Rhizophora*," in Silva of N. America, Sargent, v. pp. 13–17.——"Mangrove Tannin," in The Tannins, Trimble ii. pp. 101–104 (Lippincott Co., Philadelphia, 1894).——"Mangroves," Corbett, in Bull. Bot Dept. Jamacia, ii. 1895, pp. 146–151, chiefly on the effects of the destruction of the trees.——"Mangrove Barks," in Tech. Rep. & Sci. Papers, Imp. Inst. Part 1, 1903, pp. 186–190.——"La Question des Palétuviers," Baillaud, in Journ. d'Agric. Tropicale, iv. 1904, pp. 200–206; Translation in Journ. African Soc. No. xiv. Jan. 1905, pp. 172–182.——"Utilisation of Mangrove Bark," in Bull. Imp. Inst. 1905, pp. 345–353.——"Die Mangrove Vegetation," Karsten, in Vegetationsbilder, Karsten & Schenck, ii. Part 2, 1905, pp. 10.——"The Mangrove Bark Industry of East Africa," in The Trop. Agric. xxiv. 1905, pp. 617–619.——"Preisausschreiben für die Herstellung eines Mangrovenextraktes . . . ," Albrecht, in Tropenpflanzer, 1905, pp. 475–476.——"Mangrove Barks," in Govt. Gaz. S. Nigeria, June 21st, 1911, Suppl. pp. 10–11.

POGA, Pierre.

Poga oleosa, *Pierre*, in Bull. Soc. Linn. Paris, ii. (1896, p. 1254).

A large tree (*Barter*) 60 ft. high (*Pierre*). Leaves 6 in. long, 2½ in. broad, oblong obtuse acuminate, rounded at the base, coriaceous; petioles about ½ in. long. Racemes 4–5 in. long; sepals 4, deltoid, ½ lin. long; petals 4, ½–¾ lin. long, laciniate, tortuous in bud. Fruit globose 1½–2 in. diam.; pericarp fleshy outside, bony and cerebriform inside. Seed about ¾ in. long, ⅓ in. across, oily.

Vernac. names.—Iku (Yoruba, *Barter*); Inoy (W. Africa, Imp. Inst. No. 4, Herb. Kew); M'pogoi (Gaboon, *Klaine*); M'Poga (Gaboon, *Pierre*); Njore-Njole (Cameroon, Tropenpfl. 1908, p. 83).

Brass River: Eppah.

Used medicinally in Yoruba; sold in the markets at Eppah (Barter, Mus. Kew).

The kernels contain about 57 per cent. of oil (Edie, Journ. Inst. Comm. Res. Tropics, Liverpool Univ. iii. 1908, p. 29), somewhat resembling that of cotton seed, but the uses to which it could be put are not defined, probably the same as for cotton seed, ground nut, sesame, &c. A nominal value in this country was given at £9 to £10 per ton (Bull. Imp. Inst. 1906, p. 201).

Ref.—" Oil of *Mpoga oleosa* " in Pharm. Journ. [4] xxiv. 1906, p. 27.——" Inoy kernels from West Africa," in Bull. Imp. Inst. iv. 1906, pp. 200–202.——" Inoy Kernel Oil from S. Nigeria," l.c. vi. 1908, pp. 357–358. " A propos de l'exploitation des graines d'Inoy (*Poga oleosa*) en Afrique occidentale," in Journ. D'Agric. Tropicale, ix. 1909, p. 285.

COMBRETACEAE.

TERMINALIA, Linn.

Terminalia avicennioides, *Guill. et Perr.* ; Fl. Trop. Afr. II. p. 416.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 64 ; Engl. Monogr. Afr. Pflan. *Combretaceae* (1900) t. 4. f. c.

Nupe ; Bornu, West Africa—Senegambia to the Cameroons, extending to Abyssinia.

Wood suitable for cabinet work (Moloney, For. W. Afr. p. 351).

Terminalia Catappa, *Linn.* ; Fl. Trop. Afr. II. p. 416.

Ill.—Rheede, Hort. Mal. iv. tt. 3, 4 ; Rumpf, Amb. i. t. 68 ; Lam. Encycl. t. 848, f. 1 ; Dict. Sc. Nat. t. 8 ; Desc. Ant. iv. t. 279 ; Bot. Mag. t. 3004 ; Wight, Ic. Pl. Ind. Or. i. t. 172 ; Nuttall, N. Amer. Sylva. i. t. 32 ; Bedd. Fl. Sylv. t. 18 ; Mart. Fl. Bras. xiv. pt. 2, t. 33, f. 1 (seed) ; Engl. & Prantl, Pflan. iii. pt. 7, f. 54 A–C ; Engl. Monogr. Afr. Pflan. *Combretaceae* (1900) p. 10, f. 4 ; Contr. U. S. Nat. Herb. viii. pt. 2, t. 57 & p. 250 ; Shattuck, Bahama, Is. t. 34 (habit) ; Miyoshi, Atlas Japan Veg. t. 19 (habit).

Vernac. names.—Almendro (Porto Rico, *Cook & Collins*) ; Talisay (Philippines, *Tavera & Thomas*) ; Buak Ketapang (Malaya, *Ratton*). —Indian Almond, Tropical Almond, Fijian Almond, Wild Almond, Badamier, Badamier de Malabar.

Native of the East Indies. Cultivated in India, Burma, Africa, and most tropical countries.

The kernels are eaten as dessert, and have a flavour like that of Almonds (*Prunus Amygdalus*).

The bark and leaves yield a black dye, with which the natives of Madras colour their teeth and it is also made into Indian ink (Beddome, Fl. Sylv. t. 18). The leaves are used to feed the Tasar or Katkura silk worm (*Antheraea Paphia*) (Gamble, Man. Ind. Timb. p. 337). In French Guiana the astringent root-bark is used in cases of dysentery and diarrhœa ; the stem bark is recommended as a cure for bilious fever (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 84), and a decoction for atonic diarrhœa, and as a lotion for ulcers (Tavera & Thomas, Med. Pl. Philippines, p. 110), the kernel oil together with the juice of the young leaves is used in the preparation of an ointment for skin diseases, and the leaves macerated in palm-oil are applied as a remedy in tonsilitis (Heckel, l.c.).

The wood is comparatively soft ; weighs 32 to 41 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 337), 58 lbs. per cubic foot (West Indian Bull. ix. 1909, p. 298). Used for furniture and house work in Jamaica (l.c.), for various purposes in Madras (Beddome, Fl. Sylv. t. 18).

Propagated by seed, and planted out when old enough to handle in permanent places, 20 to 30 feet apart.

It is a handsome decorative tree; grows to a large size, and in Queensland comes into bearing after 3 years (Newport, Queensland, Agric. Journ. xiv. 1904, p. 359).

It is cultivated in Old Calabar, and planted in open spaces in Lagos, Ebute Metta, &c. (Foster, Govt. Gaz. S. Nigeria, Dec. 11th, 1907, Suppl. p. 14).

Terminalia macroptera, *Guill. et Perr.*; Fl. Trop. Afr. II. p. 416.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 63.

Vernac. names.—Kanderri ? (Katagum, *Dalziel*); Owawe (Benin, *Thompson*); Opauk (Acholi, Uganda, *Dawe*); Onora ba (Fr. Guinea, *Pobeguin*).

Widely distributed in West Africa.

Wood handsome and close grained (Moloney, For. W. Afr. p. 351); has been sold as teak, realising 1*s.* 10*d.* per cubic foot (Thompson List of For. Trees, S. Nig. 1910, p. 10).

A small tree with handsome foliage, growing in park-like country Acholi, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 45).

Terminalia superba, *Engl. & Diels*, in Engl. Monogr. Afr. Pflan. *Combretaceae* (1900), p. 26.

A tree of magnificent proportions from 70-140 ft. in height, with a broad crown; branches heavily marked with scars of fallen leaves. Leaves closely arranged at the ends of branches, entire, 3–6 in. long, 2½–3 in. broad; lamina somewhat crinkled at the margin, glabrous, of a thin leathery texture, shortly acuminate at the apex, narrowed gradually at the base into a long petiole varying from 1½–2 in. in length. Flowers borne on long axillary spikes; lower receptacle conical, rather angular, pubescent; upper receptacle flat, pubescent; disc covered with long hairs. Fruit 2–winged, glabrous, sessile, ¾ in. long, 2 in. broad.

Ill.—Engl. l.c. t. 14, f. B. a–e.

Vernac. names.—Afara (Lagos, *Punch*, *Dodd*); Afara (Yoruba, *Thompson*); Aaha (Benin, *Thompson*); Mukonja (Cameroons, *Jentsch*); Offram (Gold Coast, *Thompson*).

Lagos (Punch, No. 125A, 1901, Herb. Kew); S. Nigeria (Dodd, No. 393, 1908, Herb. Kew).

Bole straight, wood soft, and splits easily (Punch, l.c.); used for bridges and shingles (Thompson, List of For. Trees, S. Nig. 1910, p. 10; Col. Rep. Misc. No. 66, 1910, p. 198); and for house-posts (Bot. Ent. in W. Afr. 1889-1901, p. 66, "Afara").

Ref.—"Mukonja weiss, *Terminalia superba*," in Der Urwald Kameruns, Jentsch, Tropenpflanzer, Beihefte, March, 1911, pp. 174–175.

Terminalia togoensis, *Engl. & Diels*, in Engl. Monogr. Afr. Pflan. *Combretaceae* (1900), p. 13.

Tree bearing leaves closely arranged at the ends of the branches; branches covered with a close-set, fawn-coloured tomentum. Leaves obovate or obovate-oblong, entire, 4–5½ in. long, 2–2½ in. broad, glabrous on the upper surface, pubescent on the lower; young leaves covered with a silky pubescence on both surfaces. Lamina shortly acuminate at the apex, acute at the base with a hairy petiole ½–1 in. long. Spikes terminal in the axils of the leaves, covered with pubescence; lower receptacle cylindrical, upper receptacle cup-shaped; disc hairy. Fruit 2-winged, shortly stalked, 2½ in. long, ⅚ in. broad, slightly emarginate at the tip, slightly attenuate at the base, covered with tomentum similar to that on the branches.

Ill.—Engl. Monogr. Afr. Pflan. *Combretaceae* (1900) t. 5, f. b.

Vernac. name.—Idi (Lagos, *Foster*); Idi (Yoruba, *Thompson*).

Lagos (Foster, No. 29, 1906, Herb. Kew).

The timber is used for canoes (Bot. Ent. in W. Afr. 1889–1901, p. 66, "Idi") and for making house posts; the bark medicinally, and the roots medicinally, and as "chew sticks" in S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 10).

Terminalia sp.

Vernac. names.—Opepe or Epepe (Yoruba, *Punch*).—Brimstone Wood.

Ibadan Forest Reserve (Punch, No. 122, 1901, Herb. Kew).

Used as planks and for canoes; a tree likely to furnish timber suitable for the home markets (Kew Bull. 1908, p. 193).

Common in the mixed forests of the Central and Western Provinces of S. Nigeria (l.c.).

CONOCARPUS, Gaertn.

Conocarpus erectus, *Jacq.*; Fl. Trop. Afr. II. p. 417.

Ill.—Jacq. Icon. Select. Stirp. Am. t. 52; Commelin, Hort. Med. Amstel. Pl. t. 115; Sloane, Voy. Jamaica, ii. t. 161, f. 2; Catesby, Nat. Hist. Carolina, Florida, and Bahama Is. ii. t. 33, f. 1; Lam. Encycl. t. 126; Desc. Ant. vi. t. 399; Nuttall, N. Amer. Sylva, i. t. 33; Sargent, Silva, N. America, v. t. 202; Ann. Inst. Col. Marseille, ix. 1902, t. 2.

Vernac. names.—Zaragova (B. Honduras, Bull. Imp. Inst. 1907, p. 345).—Button Wood, Manglier gris.

Bonny River, and throughout the swamp regions of West Africa. Common in the swampy coasts of Tropical America.

The bark (from British Honduras) has been found to contain 18·7 per cent. of tannin, and though too poor for export it is excellent material for tanning purposes locally, and yields a better leather than the red mangrove (*Rhizophora Mangle*) (Bull. Imp. Inst. l.c.).

The wood is useful for posts and piles, said to be lasting both in and out of the ground and in salt water (West Indian Bull. ix. 1909, p. 301); weight 62 lbs. per cubic foot (Curtiss, Mus. Kew). Catesby (l.c. p. 33) states that, "being small I know of no meckanik use they are put to, but for burning it is esteemed the best wood in these latitudes" (Carolina, Florida, Bahama Is. &c.).

ANOGEISSUS, Wall.

Anogeissus leiocarpus, *Guill. et Perr.*; Fl. Trop. Afr. II. p. 418.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 65; Tropenpfl. (Beihefte), Oct. 1906, p. 255 (habit); Engl. & Drude, Veg. Erde, ix. t. 43 (habit, from Tropenpfl. l.c.).

Vernac names.—Ayin (Yoruba, *Thompson*, *Foster*); Marike (Hausa, *Dalziel*); Kojoli (Fufulde, *Dalziel*); Murke (Gorgoram, *Elliott*); Murke (Guarara River, *Elliott*); Echeché (Togo, Tropenpfl. l.c.); Silug or Sahaba (Arabic, *Muriel*); Khai (Hameg, *Muriel*).—Chewstick.

Lagos, Oloke Meji, Zungeru, Yola. Widely distributed in West Africa, extending to Abyssinia and Central Africa.

Yields an insoluble gum ; eaten in Kordofan (Muriel, Herb. Kew).

Timber good, Kordofan (Muriel), exceedingly hard and fairly durable (Thompson, Rep. Meko and Skaki Dist. 1910, p. 7) ; impervious to white ant (Elliott, Herb. Kew).

The ashes of the wood are used by the natives as a mordant for dyeing.

The bark is used medicinally, and the roots as "chew-sticks" (Thompson, l.c. p. 8 ; Col. Rep. Misc. No. 51, 1908, p. 62, and No. 66, 1910, p. 89 ; List of For. Trees, S. Nig. 1910, p. 10).

The tree is very common on alluvial land in the Meko and Shaki district (Thompson, l.c) ; common throughout the northern part of N. Nigeria (Elliott, Herb. Kew) ; grows up to 50 feet high, Anum Plains, Gold Coast (Johnson, Herb. Kew), and a medium sized tree. Bari, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 45).

LAGUNCULARIA, Gaertn.

Laguncularia racemosa, *Gaertn.* ; Fl. Trop. Afr. II. p. 419.

Ill.—Jacq. Icon. Select. Stirp. Am. t. 53 (*Conocarpus racemosus*) ; Gaertner, Fruct. Sem. Pl. iii. t. 217, f. 2 ; Velloso, Fl. Flum. iv. t. 87 (*Bucida Buceras*) ; Nuttall, N. Amer. Sylva, i. t. 34 ; Sargent, Silva, N. America, v. t. 203 ; Engl. Monogr. Afr. Pflan. *Combretaceae* (1900), p. 33, f. 5 ; Contr. U. S. Nat. Herb. viii. t. 43.

Niger River ; widely distributed in the Mangrove area in West Africa from Sierra Leone to Loanda. Found also in Central America under similar conditions.

White Mangrove, White Button Wood, Red Mangrove of Cuba (Fosalba, *seq.*).

The bark is described as thin and papery, of light brown colour, splitting readily into two portions, the inner layer smooth, and the outer rough and of darker colour. The leather produced is said to be excellent and similar in quality to that produced by oak bark. Samples from British Honduras have been valued at £3 per ton, and the extract, provided it retained the good colour and weight-giving qualities characteristic of the bark, would sell readily in this country (Bull. Imp. Inst. 1907, p. 345).

Bark from British Honduras has been found to contain 12·3 per cent. (l.c.), and that from Cuba 24 per cent. of tannin. Upwards of 5000 metric tons of the bark and leaves were shipped from Havana in 1905, destined for the United States, Russia and Germany. The price on the Havana markets is given at 105 fr. 30 for bark and 67 fr. 40 for leaves per metric ton (Fosalba, L'Agric. prat. pays chauds, vi. 2, 1906, p. 522).

There seems to be no doubt that this bark as a tanning material is more reliable than that of the Red Mangrove (*Rhizophora racemosa*), but it is doubtful whether the tannin percentage is sufficiently large and constant to make it suitable for export.

The wood is heavy, hard, strong and close-grained, specific gravity of dry wood 0·7137 or 44·48 lbs. a cubic foot (Sargent, Silva, N. America, v. p. 29) ; 44 lbs. per cubic foot is the recorded weight of a sample from British Honduras (Belize Estate and Produce Co. Mus. Kew).

Ref.—"Note sur le Manglier rouge (*Conocarpus racemosa*)," Fosalba, in L'Agric. pratique pays chauds, vi. 2, 1906, pp. 521–523.

COMBRETUM, Linn.

Combretum bracteatum, *Engl. & Diels*, in Engl. Monogr. Afr. Pflan. *Combretaceae* (1899) p. 100.

[*Cacoucia paniculata*, Laws. ; Fl. Trop. Afr. ii. p. 434.]

Climbing shrub bearing long racemes of flowers. Leaves with short articulate petioles, in opposite pairs, oblong or ovate-oblong, tapering at the apex, rounded at the base, 3¼–5¼ in. long 2–1½ in. broad, glabrous, of a thin leathery texture. Branches dark, glabrous, covered, when young, with a rusty pubescence. Racemes up to 19½ in. long; inflorescence covered with rusty pubescence. Bracts prominent, ovate, 1½ in. long. Flowers large, about 2¼ in. long, lower receptacle narrow, angular, upper broadly cylindrical. Fruits shortly stalked, truncate at the base, slightly emarginate at the apex, very shortly pubescent. Body of the fruit 1½ in. long, very narrow, wings broad making the fruit almost orbicular.

Ill.—Hook. Ic. Pl. t. 2548 (*Cacoucia splendens*), t. 2549 (*Cacoucia platyptera*) ; Engl. Monogr. Afr. Pflan. *Combretaceae* (1899) t. 29, f. B.

Vernac. name.—Ogan dudu (Lagos, *MacGregor*, *Dawodu*).

Lagos (MacGregor, No. 191, 1902) ; Old Calabar (Holland, No. 12, 1897).

Used medicinally, Lagos, (MacGregor, l.c.), the leaves in decoction as a tonic and febrifuge (Millson, Kew Bull. 1891, p. 210).

A handsome decorative plant. Welwitsch describes it as the most beautiful member of the family in Angola (Hiern. Cat. Welw. Afr. Pl. ii. p. 354, *Campylochiton platypterus*).

Combretum glutinosum, *Perr.* ; Fl. Trop. Afr. II. p. 432.

Ill.—Guillem. Perr. Rich. Fl. Senegamb. t. 68.

Vernac. names.—Dalo (Katagum, *Dalziel*) ; Ratt (Senegambia, *Guillemin & Perrotet*, *Engler*) ; Diamba or Simba Bali (French Guinea, *Pobeguin*).

Nupe ; Zungeru ; Katagum ; Msugu. Throughout W. Africa, and extending to Central Africa.

Yields a dye, used by the natives of Senegambia (Guillem. Perr. Rich. l.c. p. 289), where the alkaline ash is used for fixing the Indigo blue in dyeing cotton (Engl. Monogr. Afr. Pflan. *Combretaceae*, p. 49).

The root and bark yield a yellow dye ; an infusion of the leaves is used as a cure for colds and a decoction for washing wounds, French Guinea (Pobeguin, L.'Agric. prat. pays chauds, xi. 1911, p. 392).

Combretum Hartmannianum, *Schweinf.* ; Fl. Trop. Afr. II. p. 431.

Ill.—Schweinfurth, Pl. Nilot. tt. 14, 15, and Beitr. Fl. Aethiop. t. 3.

Vernac. names.—Zindi (Katagum, *Dalziel*) ; Subaris-wad—Black Subar (Arabic, *Muriel*).

Katagum (Dalziel, No. 221, Herb. Kew).

This species is believed to yield part of the gum sold in the country as "Mumuye" gum (Dalziel, Kew. Bull. 1910, p. 136).

Combretum leonense, *Engl. & Diels*, in Engl. Afr. Pflan. *Combretaceae* (1899), p. 51.

Leaves in whorls of three. Young branches slender, covered with velvety tomentum. Leaves, in the dried state, of a peculiar light green colour, ovate, acuminate at the apex, narrowed at the base into a petiole ½ in. long ; leathery in texture, glabrous on the upper surface tomentose and strongly veined on the lower, 4¾ in. long, 2½ in. broad. Flowers small, in short racemes clustered to form panicles, all parts of the inflorescence covered with tomentum. Fruits elliptical, glutinous when young, 4-winged.

Vernac. names.—Wiyan demmu (Katagum, *Dalziel*); Chiriri (Sokoto, Bull. Imp. Inst. 1910, p. 163).

Katagum (*Dalziel*, No. 347, Herb. Kew).

"Mumuye" gum is said to be obtained chiefly from this species. It is not regarded as of much commercial value being worth only 12*s.* per cwt. on the London Market (Bull. Imp. Inst. 1910, p. 355). It usually occurs in lumps of a dark smoky colour (Dalziel, Kew Bull. 1910, p. 135). Gum classed under this name is obtained from Kombo and Shillem on the river Gongola and districts south of the Benue (l.c. p. 136). The bark is medicinal (Dalziel, Herb. Kew).

Combretum micranthum, *G. Don*; Fl. Trop. Afr. II. p. 428, *pro parte.*

[*C. Raimbaultii*, Heckel, Rep. de Pharm. 1891.]

Ill.—Engl. Monogr. Afr. Pflan. *Combretaceae*, t. 4, f. B; L'Agric. prat. pays chauds, ii. 1902, p. 68, f. 1 (photo of specimen, Herb. Chevalier); p. 72, f. 2 (Sections of stems of "Kinkéliba," & *C. micranthum*, showing similarity of structure).

Vernac. names.—Okan (Lagos, *Dawodu*); Kinkelibah, Kinkelebar, or Kankeliba (Senegal, Sierra Leone, *Scott Elliot*, *Heckel*, *Engler*, *Merck*, *Wallis*); Kinkaliba, Bara Oulé (Fr. Guinea, *Pobeguin*).

Nupe (Barter, No. 1645, Herb. Kew), and in West Africa from Senegambia to the Niger.

A decoction of the leaves is recommended as a cure for blackwater fever (Merck's, Ann. Rep. 1896, p. 121; Wallis, Cons. Rep. Ann. No. 3750, 1907, p. 11), and Raimbault advises it for all gastric and bilious disorders. He considers a glass taken while fasting in the morning the best remedy for helping Europeans to become accustomed to the climate of W. Africa (Merck, l.c. p. 122).

Ref.—"Sur l'emploi des feuilles de *Combretum Raimbaultii*, contre la fièvre bileuse hématurique," Heckel, in Journ. Les Nouveaux Remèdes et Repertoire de Pharmacie, 1890.——"Folia Combreti Raimbaultii," in Merck's Ann. Rep. for 1895 (March, 1896), p. 121–122.——"Le Kinkéliba," Perrot et Lefèvre, in L'Agric. prat. des pays chauds, ii. 1902, pp. 67–77, illustrated.

Combretum mucronatum, *Sch. et Thonn.*; Fl. Trop. Afr. II. p. 426.

Vernac. names.—Agbon Igbo or Agbon Odon (Yoruba, *Millson Moloney*); Okan (Lagos, *Millen*); Lawo (Lagos, *Dawodu*).

Lagos; Abeokuta; Cross River.

Leaves boiled and used as a preventive against sickness by the natives in Lagos (Millen, Herb. Kew).

Combretum Zenkeri, *Engl. & Diels*, in Engl. Monogr. Afr. Pflan. *Combretaceae* (1899) p. 66.

Climbing shrub. Young branches, covered with rusty tomentum, older branches almost glabrous with a darker cortex. Leaves opposite, petioles short, articulate, the basal part remaining after the fall of the leaf. Lamina 4 in. long, 1¾ in. broad, papery, glabrous on the upper surface, pubescent and lighter in colour on the lower, slightly acuminate at the apex, rounded at the base. Inflorescence a large panicle with 3-forked tomentose branches, the ultimate branches ending in globular capitula of small flowers. Bracts leaf-like but smaller, decreasing in size towards the apex of the panicle. Flowers many in each capitulum, tomentose, the lower receptacle fusiform, the upper funnel-shaped. Fruits small, pubescent, wings square at the top, tapering at the base, body of fruit very narrow, projecting at the top beyond the wings.

Ill.—Engl. Monogr. Afr. Pflan. *Combretaceae* (1899) t. 20D.

Vernac. name.—Ogan (Lagos, *MacGregor*).

Oloke Meji (Foster, No. 130, Herb. Kew); Lagos (MacGregor, No. 209, Herb. Kew); Abeokuta (Irving, No. 81, Herb. Kew).

Used medicinally in Lagos (MacGregor, l.c.).

QUISQUALIS, Linn.

Quisqualis indica, *Linn.*: Fl. Trop. Afr. II. p. 435.

Ill.—Pal. de Beauv, Fl. Ow. Ben. i. t. 35 (*Q. ebracteata*); Bot. Mag. t. 2033; Bot. Reg. (1820–21), t. 492; Geel, Sert. Bot. iv.; Rchb. Icon. Bot. Exot. t. 233; Maund, Bot. Anist. ii. t. 73; Wight, Illust. t. 92; Spach Suites (Hist. Nat. des Vegetaux) t. 32, f. 1; Rev. Hort. 1858, f. 38; Vidal, Fl. For. Filip. t. 48 D (fl. & fr.); Engl. Monogr. Afr. Pflan. *Combretaceae* (1900) p. 6, f. 3.

Vernac names.—Ogan funfum (Lagos, *Foster*); Bamtaki (Hausa, *Engler*); She-Keun-tsze (China, *Hanbury*).

The Rangoon creeper.

Lagos; Abeokuta; Old Calabar; Lokoja; Guarara River. Found also in the Cameroons and Gaboon. Cultivated throughout India.

Seeds used as an anthelmintic in the Moluccas and roasted, as a cure for diarrhœa in China, and a decoction of the leaves for flatulency (Dict. Econ. Prod. India).

The wood is soft, porous and of little or no value. A portion of stem in the Museum at Kew, grown in the Botanic Gardens, Calcutta, is only 5 in. in diameter, although described as being 42 years old.

MYRTACEAE.

EUCALYPTUS, L'Hér.

Trees, native of Australia, Tasmania, and to a smaller extent of New Guinea and the Indian Archipelago. Cultivated in most of our Colonial Dependencies in the Tropics, in the United States, California, Algeria and other countries bordering the Mediterranean.

Various species have been tried in the Botanic Stations of Nigeria as also in other parts of W. Africa since about 1874, when seeds were sent out from Kew. Further consignments of seed were sent out in 1879 to Lagos, the Gold Coast, Sierra Leone and the Gambia, including the species *Globulus*, *amygdalina*, *obliqua*, *luxurians*, and some Queensland species. In 1881 Moloney reported that some of the plants raised from this collection in Lagos were then 23 ft. high, and 2½ in. in diameter, and Rowland in July of the same year records *E. acmenoides*, *E. resinifera*, and *E. Baileyana* as doing remarkably well in Lagos (*see* Mem. on the Attempts to Cultivate the Eucalyptus in W. Afr. Colonies, in Bot. Ent. in W. Africa, 1889–1901, p. 128; Moloney, For. W. Afr. pp. 224–230.)

Eucalyptus citriodora was favourably mentioned by McNair at Ebute Metta in 1889, a number of plants having been raised from seeds sent out from Kew in 1888 (Report, Bot. St. Ebute Metta, 30th June, 1888–1889, though Millen (Report, 31st Dec. 1891) records but one plant of this species in a permanent place there in 1891. Two young trees were doing well in the Botanic Garden at

Old Calabar in 1899. Millen (Report, Bot. St. Ebute Metta, 31st Dec. 1891) records ten plants of *E. tesselaris*, and twelve *E. tereticornis*, in permanent places. At the same time he reports one plant of *E. calophylla*, one *E. goniocalyx*, two *E. merstheca* and four *E. creba* at Ebute Metta. In 1892 Millen further reports (30th June, 1892) that "the Eucalyptus planted out about 16 months ago have done well, and improved the swampy ground in which they were planted," the growth made during that time being stated as from 18–24 feet. In 1899 it was proposed to fill up certain (kokomaiko) swamp lands covering about 27 acres in Lagos, and to convert them into a Eucalyptus Park. Seeds of three species of *Eucalyptus* which appeared to thrive in Lagos—*tereticornis*, *tesselaris*, and *rudis*—were specially requisitioned by the Secretary of State from Trinidad for the purpose, and all the seeds procurable in Lagos were collected and sown, but from these latter only about 90 seedlings were raised and planted out on the reclamation then completed (*fide* letters, Governor, Lagos to Col. Office, Aug. 2nd, 1899, April 2nd, 1900 ; Director, Royal Gardens, Kew, to Col. Office, Nov. 26th, 1900 ; Col. Office to Governor, Lagos, and Director, Royal Gardens, Kew, Dec. 20th, 1900). Seedlings of "Blue Gum" are reported as being grown for distribution at Naraguta, Pangan and Bauchi (Duff, N. Nigeria Gaz. Oct. 31st, 1910, Suppl. p. 245).

There are upwards of 150 species known, all of which are more or less valuable for their timber—suitable for shipbuilding, railway sleepers, mill-work, paving, agricultural implements, &c., bark for tanning—though limited perhaps in this respect, the most prominent being Mallet Bark (*E. occidentalis*), Kino from the wood, oil from the leaves—used medicinally, the flowers as food for bees, and as ornamental trees.

Some of the trees attain an immense size—300–400 ft. high, with a bulk in proportion. *Eucalyptus amygdalina* and *E. Globulus* are amongst the largest, and they together with *E. citriodora* are perhaps the most important for producing oil, as well as being valuable timbers.

The "Lemon-scented Eucalyptus" (*E. citriodora*) is perhaps the best known under cultivation in tropical countries.

It is one of three species (*citriodora*, *tereticornis*, & *tesselaris*) considered the most useful in Dominica (West Indian Bull. x. 1909, p. 125). In all hot countries, where most or all species tried have failed, this seems to have grown without difficulty, and, as already intimated, has proved no exception in Nigeria when once established.

"Blue gum" (*E. Globulus*) is perhaps the most familiar species under cultivation in sub-tropical or in the highlands of some tropical countries. It has succeeded well in the miasma stricken parts of Italy and is almost naturalised in Algeria. Oil from the leaves of this species in the Transvaal has been found of excellent quality and well suited for medicinal use (Pharm. Journ. [4] xxviii. 1909, p. 4).

According to Brandis (Indian Trees, p. 328) the timber production to the age of 20 years on the Nilgiris is 470 cubic feet of solid wood per acre per annum. He draws the comparison with "Spruce" (*Picea excelsa*) in Europe, which up to the same age, under the most favourable conditions, only produces 70 cubic feet per acre annually.

The effect of Eucalyptus as a preventive of malaria has no doubt been much over-rated and their culture for this purpose is not recommended, but for general utility there is perhaps no better class of trees more likely to repay with advantage any effort that may be made to naturalize them. Their rapid growth, when once they are well established, is a good recommendation, and the main object should be to establish them on soils and in localities where indigenous trees are absent or inferior in value.

It is not unlikely that in many cases failure has resulted, because of the difficulty of raising the seeds, the tendency of the seedlings to damp off, and the losses entailed in transplanting.

The seed of most species is small and requires special care in sowing and watering. It is best to raise the plants in nursery beds, or shallow boxes, and prick them off singly when large enough to handle into bamboo pots. The beginning of the dry season (about October) is perhaps the most suitable time to sow, and the young plants should be ready for planting out in permanent places in about six months, or during the following rainy season.

The recognised principle of planting thickly in order to induce straight growth may be well applied here, thinning out according to development. At almost every stage the trees would be useful for some purpose—cover, firewood, poles, &c.

The literature on the Eucalypts is somewhat extensive, and the following list contains some of the more important works.

Ref.—L'Eucalyptus de L' Accroissement et de valeur Progressive de L'Eucalyptus, Trottier, pp. 1–16 (Typog. et Lithog. a Bouyer, Algeria, 1871).——Eucalyptographia: A Descriptive Atlas of the Eucalypts of Australia and the Adjoining Islands, Baron von Mueller, (Trübner & Co., London, 1879–1884).——"Eucalyptus oil," in Useful Native Pl. Australia, Maiden, pp. 255–275.——"Eucalyptus Timbers," l.c. pp. 427–529 (Trübner & Co., London, 1889).——"On the so-called Eucalyptus Honey," Anderson Stuart, in Pharm. Journ. [3] xxi. 1890, pp. 513–518 & pp. 522–524.——"Eucalyptus," Abbot Kinney, U.S. Dept. Agric. Bureau of Forestry, Bull, No. 11, 1895, pp. 23–28.——"Eucalyptus timber for Street-Paving," in Kew Bull. 1897, pp. 219–221.——Eucalypts Cultivated in the United States, McClatchie, U.S. Dept. of Agric. Bureau of Forestry, Bull No. 35, 1902, pp. 1–106, illustrated—91 plates, and a Bibliography. ——"Eucalyptus," in Man. Ind. Timb. Gamble, pp. 352–354 (1902). ——"Blue Gum," *Eucalyptus Globulus*, in Kew Bull. 1903, pp. 1–10. ——"Les Eucalyptus et leurs usages," in Les Pl. Utiles du Congo, De Wildeman, i. 1903, Art. xv. pp. 175–198.——"The Culture and Uses of the Species of Eucalyptus," in West Indian Bull. iv. 1903, pp. 145–166.——"Eucalypts in the West Indies," l.c. pp. 166–175.——"Eucalyptus Oils," in Bull. Imp. Inst. ii. 1904, pp. 140–145; l.c. pp. 215–217; l.c. iii. 1905, pp. 1–6.——Eucalypts, Pinchot, U.S. Dept. Agric. Forest Service, Circ. No. 59, Jan. 1907, pp. 1–6; revised, Oct. 1907, pp. 1–13, giving *E. Globulus*—Uses, Methods of Propagation, Planting, Cultivation, Cost of Planting & Returns; "Sugar Gum" (*E. corynocalyx*); "Lemon Gum" (*E. citriodora*); and "Grey Gum" (*E. tereticornis*).——"Eucalyptus in California," Ingham, Univ. of California, Agric. Exp. Station, Bull. No. 196, 1908, pp. 29–112, illustrated.——"Eucalyptus in the West Indies," in West Indian Bull. x. 1909, pp. 125–129.——"The Blue Gum and other Introduced trees on the Nilgiris," in Report on the Forests of British

East Africa, Hutchins, 1909, pp. 102–103, and pp. 117-121.——A Critical Revision of the Genus Eucalyptus, Maiden, Vol. i. pp. 1-349, with 48 plates, Vol. ii. in preparation.——"Durable Hardwoods," in Some Notes on Tree Planting in the Shire Highlands, Purves, in Suppl. to the Nyasaland Govt. Gaz. 31st Jan. 1910, pp. 2–4.——Eucalypts in Florida, Zon & Briscoe, U.S. Dept. Agric. Forest Service, Bull. No. 87, 1911, pp. 1–47.

PSIDIUM, Linn.

Psidium Guayava, *Linn.* Sp. Pl. (1753), p. 470.

A small tree. Leaves ovate or elliptic oblong, more or less glabrous above, pubescent below, 3–5 in. long, 1½–2 in. broad. Flowers white, 1–1½ in. in diameter. Fruit globose, sometimes ovoid (as in var. *pomiferum*) or pear-shaped (as in var. *pyriferum*), 1½–2 in. in diameter, edible, many seeded.

Ill.—Rheede, Hort. Mal. iii. t. 34 (*P. pyriferum*), t. 35 (*P. pomiferum*) ; Rumpf, Amb. i. t. 47 (*Guaiavus domestica*), t. 48 (*P. pomiferum*) ; Ruiz, Lopez, & Pavon, Fl. Peruv. Tabulae ined. t. 418 (*P. pyriferum*) ; Lam. Encycl. t. 416, f, 1 (*P. pyriferum*) ; f. 2 (*P. pomiferum*) ; Tuss. Ant. ii. t. 22 (*P. pomiferum*) ; Dict. Sc. Nat. t. 224 (*P. pomiferum*) ; Desc. Ant. ii. t. 72 (*P. pyriferum*) ; Bot. Reg. (1827), t. 1079 (*P. pyriferum*) ; Penfold, Madeira, Fl. Fr. & Ferns, t. 2 (*P. pomiferum*) ; Vidal, Fl. For. Filip. t. 50 B (fl. & fr.) ; Queensland Agric. Journ. viii. 1901, p. 108 (outline fig. of Red or Cayenne Guava) ; Freeman & Chandler, World's Comm. Prod. p. 269.

Guava, Apple Guava, Pear Guava.

Native of Tropical America ; naturalised in many tropical countries.

The fruit is well known as one of the best of tropical fruits. It is used largely in the West Indies for making jelly, and unless something in the way of a preserve is made, much of the fruit is likely to be wasted, as the trees when in full bearing, usually fruit very profusely. "Guava Cheese" is also made from the fruit.

The roots, shoots and leaves are astringent and antidysenteric ; in French Guiana a diet drink is made with the roots and leaves (Heckel, Ann. Inst. Col. Marseille, iv. 1895, p. 116). The leaves are chewed to relieve toothache ; they yield 0·36 per cent. of ethereal oil of specific gravity 1·069 at 15° C., and a boiling point of about 237° C. lemon-yellow colour and slightly aromatic odour (Schimmel & Co. Semi-Ann. Rep. April, 1910, p. 123 ; Pharm. Journ. [4] xxx. 1910, p. 585). In Assam the leaves and bark are used in dyeing (Watt, Comm. Prod. India, p. 907).

The wood is very tough, and is used in the West Indies for hoe-handles, axe-handles, &c. (W. Indian Bull. ix. 1909, p. 336), wood engraving, spear handles and instruments ; weight 38–47 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 355). According to Mahon (Cons. Rep. Misc. No. 588, 1903, p. 6) it is never attacked by white ants.

Easily propagated from seed, suckers and cuttings, grows freely and quickly, and may become almost a pest. It begins to bear fruit in 2 or 3 years. Stout branches take root readily and make good fences.

Ref.—"*Psidium Guayava*" in Dict. Econ. Prod. India, Watt, vi. 1892, pp. 351-353.——"Contribution a l'étude Bot. Chim. et Thérapeut. du Goyavier (*Psidium pomiferum*), Khouri, in Ann. Inst. Col.

Marseille, ii. 1895, pp. 81–151, with a bibliography.——"Les Goyaviers comestibles," De Wildeman & Burtt Davy, in Journ. D'Agric. Trop. vi. 1906, pp. 235–236.

Psidium Cattleyanum, *Sabine*, Trans. Hort. Soc. iv. 1822, p. 317.

A small tree. Leaves obovate, coriaceous, glabrous, dark green. Flowers solitary, axillary; Calyx segments 5; petals 5, white, caducous. Stamens numerous. Fruit nearly round about the size of a small pear, claret colour when ripe, crowned with the 5 permanent segments of the calyx. Seeds numerous.

Ill.—Hort. Trans. iv. 1822, t. 11; Lindley, Collect. Bot. t. 16; Bot. Reg. (1822), t. 622; Bot. Mag. t. 2501.

Purple fruited Guava, Chinese Guava.

Native of Brazil. Also recorded as a native of China, but it is not indigenous there (Fl. Sinensis, i. p. 295).

The fruit is considered superior to that of *P. Guayava* with a flavour like that of strawberries and milk (Lindley, l.c.). It has been grown successfully under glass in this country from an early period (Scott, Journ. Hort. Soc. ii. 1847, p. 137).

Plants were sent from Kew to Old Calabar in 1899.

Cultivation the same as *P. Guayava.*

PIMENTA, Lindl.

Pimenta acris, *Kostel.* Allg. Med. Pharm. Fl. iv. p. 1526.

Tree, 30–40 ft. high. Leaves opposite, 2–3 in. long, broadly elliptic, shining above, paler and with scattered minute dots beneath. Flowers small, arranged in threes; calyx lobes 5, fleshy, superior, persistent; petals 5, white, tinged with red, glandular. Fruit ovulate, about the size of a pea, 2-celled.

Ill.—Bot. Mag. t. 3153 (*Myrcia acris*); Wight, Illust. t. 97 bis, f. 6; Bentl. & Trimen, Med. Pl. t. 110; Sawer, Odorographia, p. 57; Rep. Bot. St. Montserrat, 1906–07, f. 6 (habit, young trees trimmed to bush form, 3 years old).

Native of the West Indies, extending to Venezuela, cultivated in India.

West Indian Bay, Bay—Berry Myrtle, Wild Clove, Wild Cinnamon; Black, Red and White Cinnamon have also been applied to this species or a variety (Morris, Mus. Kew); Bois d'Inde, and Citron-smelling Bay are usually applied to the so-called var. *citrifolia.*

The leaves yield the bay oil used in the preparation of bay rum—1½ pints to a puncheon (100 galls.) of white rum (Bull. Bot. Dept. Jamaica, 1891, p. 8; W. Ind. Bull. iv. 1903, p. 122), and Florida Water, and used as a hairwash. Bay oil is used in Germany in the preparation of a "bay rum soap," with very refreshing properties (l.c. p. 126).

"Lemon-Bay Oil" is said to differ materially from Bay Oil, which is considerably affected by any mixture of leaves during manufacture (Hart, West Indian Bull. iii. 1902, p. 172).

Large quantities of the dried leaves are exported from Dominica to the United States (l.c. ix. 1909, p. 330).

The wood is hard, heavy and durable, the specific gravity is 0·8849 = 55 lbs. per cubic foot. The specific gravity of a specimen of "Bois d'Inde," in the Kew Museum, is 1·2134 = 75 lbs. per cubic foot. In the West Indies it is used in mill work for making rollers, cogs &c., and for posts, window sills &c. (l.c. ix. 1909, p. 330).

May be propagated by seed in nursery beds or bamboo pots, and planted out in permanent places about 5 to 10 feet apart, when about 6 or 9 months old.

In Montserrat, where the trees are found growing wild in various situations, it is recommended under cultivation to grow the plants in bush form, and seedling plants taken from mountain land and grown on this principle, planted 3 feet apart, yielded after 2 years growth at the rate of 2660 lbs. of leaves per acre, and after 5 years, 9440 lbs. of leaves per acre (Rep. Bot. St. Montserrat, 1909–10, p. 15).

The oil is obtained by distillation from the dried leaves, and when the leaves are shipped, drying is the only preparation required. In consequence of the insufficient supply of good quality leaves genuine bay oil has recently been very scarce (Schimmel & Co. Semi-Ann. Rep. Oct–Nov. 1902, p. 13). The supply from wild sources is said to be failing, owing to the inaccessibility or destruction of the trees, and protection has been suggested, and the cultivation extended in Dominica, Montserrat, the Virgin Isles, &c. (West Indian Bull. iv. 1903, p. 128).

The natural beauty, and the fragrant leaves which scent the air, make this a very desirable tree for ornamental purposes.

In Oct. 1905, 29 plants of the lemon-scented form were sent from Kew to Old Calabar.

Ref.—"Volatile Oil of the Leaves of *Myrcia acris*," Markoe, in Pharm. Journ. [3] viii. 1878, pp. 1005–1006.——"*Pimenta acris*," in Med. Pl. Bentley & Trimen, No. 110.——"West Indian Bay," in Odorograhpia, Sawer, pp. 56–62.——"Oil of Bay," in the Volatile Oils, Gildemeister & Hoffmann, pp. 510–512.——"Bay Oil and Bay Rum," in West Indian Bull. iv. 1903, pp. 119–122.——"West Indian Bay," l.c. pp. 122–128; Dominica, Montserrat, Bermuda; Protection and Cultivation.——"Bay Oil and Bay Rum," l.c. pp. 189–194, including details of "Bois d'Inde Citron."——"Bay Oil," Watts & Tempany, l.c. ix. 1908, pp. 271–275, including "Lemon Scented Bay Oil."——"Fruits of *Pimenta acris*," in Bull. Imp. Inst. viii. 1910, pp. 4–5.——"Real Bay Rum," Gordon, in Pharm. Journ. [4] xxxii. 1911, p. 655.

Pimenta officinalis, *Lindley*, Coll. Bot. sub. t. 19.

Tree, 23–30 ft. high. Leaves opposite, 4–6 in. long, elliptic-oblong, glabrous, deep green above, paler below, minutely glandular beneath. Flowers small, arranged in threes; calyx segments 4, fleshy, superior, persistent; petals 4, white, caducous. Fruit a berry about the size of a pea, 2-celled.

Ill.—Bot. Mag. t. 1236 (*Myrtus Pimenta*, var. *longifolia*); Tuss. Ant. iv. t. 12 (*M. Pimento*); Hayne, Darst. Beschr. Gewächse, x. t. 37 (*M. Pimenta*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 298 (*M. Pimenta*); Woodville, Med. Bot. iii. (1832) t. 194 (*M. Pimento*); Steph. & Ch. Med. Bot. t. 124 (*M. Pimenta*, vel. *Pimenta vulgaris*); Wight, Illust. t. 97*, f. 7 (*Pimenta vulgaris*); Bentl. & Trimen, Med. Pl. t. 111; Köhler, Med. Pflan ii.; Sawer, Odorographia, p. 52; Freeman & Chandler, World's Comm. Prod. p. 377 (young plant).

Allspice, Pimento.

Native of the West Indies, extending to Central America, and under cultivation in many tropical countries.

The fruits are largely used as a spice, flavouring for culinary purposes and in medicine. Oil of Pimento, obtained by distillation from the fruits, is used in perfumery and for somewhat similar purposes in medicine as oil of Cloves.

The Pimento berries of commerce are sometimes adulterated with Pimenta de Tabasco (*Myrtus Tabasco*), a native of Mexico.

The wood is close-grained and tough, suitable for general purposes in exposed situations. Young saplings or selected branches are exported from Jamaica for walking sticks and umbrella handles.

Propagated by seeds in nursery beds or bamboo pots, and planted out when large enough, about 15–20 feet apart. The trees are said to begin to bear fruit when about 8 or 10 years old (U.S. Cons. Rep. Washington, Dec. 1907, p. 132), and an average yield from a tree is 150 lbs. (Alexander, Journ. Roy. Hort. Soc. xxxv. 1910, p. 370).

In Jamaica, the chief source of the spice, the annual production is estimated at from 50,000 to 60,000 bags of 150 pounds weight, and the average price 12*s.* to 24*s.* per 100 lb. In 1907 the exports amounted to 85,000 cwt., value £76,000 (U.S. Cons. Rep. l.c.).

The main requirements under cultivation are ample rainfall, rich soil containing lime, and a hot climate. The tree thrives from sea level up to about 3000 feet.

The berries are ready for gathering as soon as they begin to ripen; and drying—in the sun on trellisses or barbecues—is the only preparation required.

This plant was under cultivation at Abutshi in 1889 (Woodruff, Rep. to Roy. Niger Co., Nov. 30th, 1889); a tree at Lagos flowered and fruited in 1895 (Millen, Report, Bot. St. Ebute Metta, Dec. 31st, 1895), and 30 plants were sent out from Kew, to Old Calabar in Oct. 1905. Plants at Aburi, Gold Coast, fruited for the first time in 1906 (Evans, Ann. Rep. Bot. & Agric. Dept. Gold Coast, 1907, p. 11).

Ref.—"Fructus Pimentae" in Pharmacographia, Flückiger & Hanbury, pp. 287–289.——"*Pimenta officinalis*," in Med. Pl. Bentl. & Trimen, No. 111, 4 pages.——"*Pimenta officinalis*," in Med. Pflan. Köhler, ii. 2 pages.——"All about Pimento," in All about Spices, Ferguson, pp. 187–197 (Colombo, 1889).——"Pimento," in Odorographia, Sawer, pp. 51–56.——"Piment de la Jamaique," in Les Drogues Simples d'origine vegétale, Planchon & Collin, ii. pp. 333–335.——"Oil of Pimenta," in The Volatile Oils, Gildemeister & Hoffmann, p. 509 (Pharm. Review Publ. Co., Milwaukee, 1900).

EUGENIA, Mich.

Eugenia caryophyllata, *Thunb.* Diss. (1788) p. 1.

An evergreen tree, 30–40 ft. high. Leaves opposite, 3–6 in. long, elliptical, glabrous, dark green and shining above, paler beneath. Flowers arranged in threes at the ends of short branches of small terminal paniculate cymes, sweet scented; calyx 4-toothed, inferior, fleshy; petals 4, yellowish, imbricated in bud, surrounded by the calyx teeth (cloves of commerce at this stage), caducous. Fruit ¾–1 in. long, elongate-oviform (known as mother cloves).

Ill.—Buée, Narrative, Clove Tree, p. 24; Lam. Encycl. t. 417 (*Caryophyllus aromaticus*); Plenck, Ic. v. t. 422 (*C. aromaticus*); Dict. Sc. Nat. tt. 222, 223 (*C aromaticus*); Bot. Mag. tt. 2749. 2750 (*C aromaticus*); Hayne, Darst. Beschr. Gewächse, x. t. 38 (*C. aromaticus*); Nees von Esenbeck, Plant. Medic, Düsseld. t. 299 (*C. aromaticus*); Wagner, Pharm. Medic. Bot. t. 225; Desc. Ant. viii. t. 566 (*C. aromaticus*); Guimpel, Abbild. Beschr. t. 72 (*C. aromaticus*);

Woodville, Med. Bot. iii. (1832) t. 193 (*C. aromaticus*); Steph. & Ch. Med. Bot. t. 95; Burnett, Pl. Util. i. t. 20b; Spach, Suites (Hist. Nat. des Vegetaux), t. 29 (*C. aromaticus*); Berg. & Schmidt, Darst. Beschr. Pharm. i. t. 3d (*C. aromaticus*); Bentl. & Trimen, t. 112; Zippel, Ausl. Handels Nährpfl. t. 19 (*C. aromaticus*); Tschirch, Ind. Heil. Nutzpfl. tt. 66, 67 (*C. aromaticus*, habit); Planchon & Collin, Drog. Simpl. ii. p. 336, f. 909 (fl. bud), f. 910 (sect. fl. bud), f. 911 (sect. fr.); Journ. Roy. Hort. Soc. xxxv. 1910, p. 368, f. 127.

The Clove.

Native of the Moluccas. Cultivated in Java, India, W. Indies, Zanzibar, Pemba, &c.

The flower buds are the cloves of commerce.

Propagated by seeds.—In Zanzibar the practice is to soak them in water for 3 days before sowing, and when germination commences they are planted out 3–6 inches apart, with the bud end above ground in shaded nursery beds. After about nine months the young plants are exposed gradually, and two or three months later they are ready for planting out in the plantation; the distance apart required here being 18 to 36 feet.

Trees begin to bear in from 5–6 years, the yield being from 35–175 lbs. per tree of cloves, according to the size and age of the trees (see Kew Bull. 1893, p. 19).

The cloves are gathered while green and unopened, either by hand or by beating the branches and collecting the falling buds on mats or cloths. Drying—which may occupy about one week—is the only preparation required before being packed for shipment.

Ref.—"Caryophylli," in Pharmacographia, Flückiger & Hanbury, pp. 280–287.——"*Eugenia caryophyllata*," in Med. Pl. Bentl. & Trimen, No. 112, 7 pages.——"All about Cloves," in All about Spices, Ferguson, pp. 117–128 (Colombo, 1889).——"*Caryophyllus aromaticus*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 202–206.——Spice and other Cultivation of Zanzibar and Pemba Islands, Diplomatic & Consular Rep. Misc. No. 266, 1892, pp. 7–13.——"Clove Industry of Zanzibar," in Kew Bull. 1893, pp. 17–20.——"Clous de Girofles," in Les Drogues Simples, d'origine vegétale, Planchon & Collin, ii. pp. 335–340.——"Oil of Cloves," in the Volatile Oils, Gildemeister & Hoffmann, pp. 512–518.——"*Eugenia caryophyllata*, in The Comm. Prod. India, Watt, pp. 526–530.

Eugenia Jambos, *Linn.* Sp. Pl. (1753) p. 470.

Tree, 20 to 30 ft. high. Leaves lanceolate, base attenuate, apex acuminate. Inflorescence in terminal cymose racemes; flowers white. Fruit white, red or rose coloured, fleshy, edible.

Ill.—Rheede, Hort. Mal. i. t. 17 (*Myrtus Jambos*); Rumpf, Amb. i. t. 39; Lam. Encycl. t. 418; Bot. Mag. t. 1696; Desc. Ant. v. t. 315; Drapiez, Herb. Amat. de Fleurs, i. t. 27; Bot. Mag. t. 3356 (*Jambosa vulgaris*); Vidal, Fl. For. Filip. t. 49E; Torreya, New York, 1907, p. 117, f. 3 (germinating seeds); Ann. Mus. Col. Marseille, 1910, f. 18; Wight, Ic. Pl. Ind. Or t. 435 (*Jambosa vulgaris*).

The Rose Apple.

Native of tropical Asia, East Indies, &c. Cultivated in India, Burma, &c.

The pulp of the fruit is edible, though not very juicy.

The tree is very ornamental and easily grown from seed. Cultivated in the Botanic Garden, Old Calabar, where it is propagated for distribution, as also at Oloke-Meji.

Ref.—" *Eugenia Jambos,*" in Dict. Econ. Prod. India, iii. 1890, pp. 287–288.

Eugenia malaccensis, *Linn.* Sp. Pl. (1753) p. 470.

A shrub, 6–8 ft. high. Leaves 9–12 in. long by about 3½ in. broad, glabrous and shining on both sides. Flowers red; petals large, suborbicular, glandular. Fruit large and juicy, edible, but not so agreeable as that of *E. Jambos.*

Ill.—Rumpf, Amb. i. t. 37 (*Jambosa domestica*); Smith, Exotic Bot. t. 61; Andr. Rep. vii. t. 458; Lodd. Bot. Cab. t. 555; Tuss. Ant. iii. t. 25; Bot. Mag. t. 4408 (*Jambosa malaccensis*); Wight, Illust. ii. t. 98 (*Jambosa malaccensis*); Vidal, Fl. For. Filip. t. 49G (fruit); Sinclair, Indig. Fl. Hawaii, t. 41.

Malay Apple, Kavika Tree.

Native of Tropical Asia, Malay Isles, &c. Cultivated in India, Burma, &c.

Fruit large and juicy, and commonly eaten in India and elsewhere.

The wood is soft; weighs 38 lbs. per cubic foot (Gamble, Man. Ind. Timb. p. 357), but the tree is of greater importance for decorative purposes.

Cultivation comparatively easy, grown from seed. Propagated for distribution at Old Calabar and Oloke-Meji.

Eugenia owariensis, *Beauv.;* Fl. Trop. Afr. II. p. 438.

Ill.—Pal. de Beauv. Fl. Ow. Ben. ii. t. 70; Guillem. Perr. Rich. Fl. Senegamb. i. t. 72 (*Syzygium guineense*).

Vernac. names.—Isinren (Lagos, *Millen*); Adere (Zungeru, *Elliott*, Yoruba, *Thompson*).

Lagos; Brass; Zungeru, and widely distributed in Tropical Africa.

A good timber tree (Elliott, Herb. Kew).

Fruit small, eaten by the natives (Millen, Herb. Kew).

Common in the field, Lagos (MacGregor); 20 ft. high, spreading habit (Millen, l.c.); a fair-sized tree along banks of streams in the Shaki District (Thompson, Rep. Meko & Shaki Dist. 1910, p. 4); a shrub 10 ft. high at Brass (Barter, Herb. Kew).

NAPOLEONA, Beauv.

Napoleona imperialis, *Beauv.*; Fl. Trop. Afr. II. p. 439.

Ill.—Pal. de Beauv. Fl. Ow. Ben. ii. t. 78; Dict. Sc. Nat. t. 66; Geel, Sert. Bot. ii.; Rchb. Exot. i. t. 137; Hook., Ic. Pl. tt. 799–800 (*N. Vogelii*), p. 5 (parts of flower); Bot. Mag. t. 4387; Hook. Fl. Nigrit. tt. 49, 50 (*N. Vogelii*); Schnizlein, Ic. t. 159 (*N. Whitfieldii*); Gard Chron. Nov. 23rd, 1844, p. 780 (structure of flowers); Rev. Hort. 1853, t. 16 (*N. Whitfieldii*); Gard. Chron. May 22nd, 1886, p. 657, f. 147A.

Vernac. names.—Odi Oban (Lagos, *Rowland*); Igbeshe ? (Lagos, *Punch*); Jumbolekono (Sierra Leone, *Scott Elliot*).

Lagos; Lokoja, and has also been collected in Sierra Leone (Whitfield), and the Gold Coast (Johnson, No. 269, Herb. Kew).

Fruits eaten by the natives, Onitsha (Moloney, For. W. Afr. p. 353). Used medicinally in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 55).

The flowers are very handsome, developed on the old wood. They are represented in figures as red and blue (original colour), but Whitfield described their colour as apricot and crimson, and added that they assume a bluish tint when decaying (Bot. Mag. t. 4387).

Found as a shrubby tree, 10–20 ft. high, Lagos (Punch, Herb. Kew), or as a low scrambling tree, Mt. Patti, Lokoja (Elliott, Herb. Kew).

MELASTOMACEAE.

DISSOTIS, Benth.

Dissotis grandiflora, *Benth.* ; Fl. Trop. Afr. II. p. 455.

Ill.—Ann. Sc. Nat. Paris, xiv. p. 119 and xiii. t. 7 (*Osbeckiastrum Heudelotii*).

Vernac. names.—Djendjeng (Sierra Leone, *Scott Elliot*) ; Gnienie (French Guinea, *Farmar*).

Sierra Leone ; Senegambia ; French Guinea.

The roots are said to contain a large amount of sugar, and are used for making wine (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 4).

Dissotis Irvingiana, *Hook. f.* ; Fl. Trop. Afr. II. p. 453.

Ill.—Bot. Mag. t. 5149.

Lagos ; Abeokuta ; Nupe ; found on the Gold Coast and extending to Abyssinia.

An ornamental plant.

Found in moist places, Nupe (Barter, Herb. Kew) ; amongst corn at Ibara, Lagos (MacGregor, Herb. Kew) ; Krobo Plains, Gold Coast (Johnson, Herb. Kew).

Dissotis segregata, *Hook. f.* ; Fl. Trop. Afr. II. p. 448.

Idu, New Calabar ; Nupe.

An ornamental plant, along margins of swamps, Nupe (Barter, Herb. Kew).

The *Melastomaceae* are in general strikingly handsome plants ; *Amphiblemma cymosum*, Naud., Fl. Trop. Afr. ii. p. 456, from West Africa has been figured in the Bot. Mag. t. 904 (*Melastoma corymbosum*) and t. 5473, but there are no specimens recorded from Nigeria.

LYTHRARIEAE.

LAGERSTROEMIA, Linn.

Lagerstroemia Flos-Reginae, *Retz.* Obs. v. p. 25.

Tree 50–60 ft. high. Leaves oblong, glabrous. Inflorescence in terminal panicles ; flowers 2–3 in. in diameter ; petals orbicular, undulate, on short claws, rose colour in the morning, deepening to purple as the day advances.

Ill.—Rheede, Hort. Mal. iv. tt. 20, 21 ; Roxb. Pl. Corom. t. 65 (*L. Reginae*) ; Wight, Ic. Pl. Ind. Or. ii. t. 413 (*L. Reginae*) ; Spach, Suites (Hist. Nat. des Vegetaux) t. 36 (*L. Reginae*) ; Nooten, Fl. Java, t. 30 (*L. Regia*) ; Bedd. Fl. Sylv. t. 29 (*L. regina*) ; Teysmannia, Batavia, xviii. 1907, p. 423 (habit) ; Vidal, Fl. For. Filip. t. 52 B (fl. fr. and seed).

Vernac. names.—Jarool or Jarul (India, Assam, *Beddome*, *Watt*) ; Pymma (Burma, *Watt*, *Gamble*) ; Banaba (Philippines, *Ahern*).—— Queen of Flowers.

Native of Tropical Asia. Cultivated in the West Indies.

The bark is astringent ; used medicinally in India, and likewise the root and leaves (Beddome, Fl. Sylv. i. p. 29 ; Mus. Kew).

The wood is of a light walnut colour (Tech. Rep. and Sci. Papers Imp. Inst. 1903, p. 292), reddish or nearly white, tough and durable under water but not under ground ; used in India for boats, canoes, gun carriages, carts, wagons, ammunition box-boards, building, &c., in Ceylon for casks and various other purposes (Beddome, Fl. Sylv. i. p. 29), in Burma where it is one of the most important timber trees, for somewhat similar purposes (Gamble, Man. Ind. Timb.) ; recommended for paving blocks, price in Rangoon (1900) for 100 sq. m. (7750 blocks), 1000 francs (Mus. Kew) ; weight per cubic foot 41·77 lbs. (Tech. Rep. and Sci. Papers, Imp. Inst. 1903, p. 292).

May be propagated by seeds, which require special care. Seed should be collected from well established trees, sown in shallow boxes, in very light sandy soil ; the seedlings may be pricked off into small pots—bamboo or earthenware—and kept growing by repotting into larger sizes in richer soil, until strong enough to plant out in permanent places. The plants begin to flower in the course of two or three years, and finally develop into large handsome trees.

In addition to its value for timber, the tree is everywhere admired for its beauty, and the main efforts seem to be centred in growing it under cultivation for ornamental purposes.

The tree is being planted along the river at Oloke-Meji, where in 1911, two acres of plants were thoroughly established (Lagos Customs & Trade Journ. Aug. 2nd, 1911, p. 157).

Ref.—" *Lagerstroemia Flos-Reginae*," in Dict. Econ. Prod. India, Watt, iv. 1890, p. 582.——" *Lagerstroemia Flos-Reginae*, (Jarul) " ; A brief account of existing information amplified by details obtained through Officers of the Indian Forest Department, and a recent report by Prof. Unwin, F.R.S., on mechanical tests of the timber at the Imperial Institute, in the Agric. Ledger, No. 9, 1897, pp. 1–7 (or of the Annual Series pp. 177–183).——" *Lagerstroemia Flos-Reginae*," in Man. Indian Timbers, Gamble, pp. 373–375.

LAWSONIA, Linn.

Lawsonia alba, *Lam.* ; Fl. Trop. Afr. II. p. 483.

Ill.—Lam. Encycl. t. 296, f. 2 (Henné) ; Plenck, Ic. t. 296 (*L. inermis*) ; Desc. Ant. viii. t. 596 (*L. inermis*) ; Wight, Illust. t. 87 ; Bedd. Fl. Sylv. (Anal. Gen.) t. 14, f. 6 ; Vidal, Fl. For. Filip. t. 52c (fl. & fr.) ; Volkens, Notizbl. App. xxii. No. 3, 1910, p. 111, t. 58 (*L. inermis*).

Vernac. names.—Lalle (Kontagora, Ilorin, *Dudgeon*) ; Lali (Lagos, *Dawodu*) ; [Khenna (Egypt) ; Al Khanna (Arabic) *Safford*] ; Cinamoms (Guam, Philippines, *Safford*) ; Chi-Kiah-hwa, (China, *Smith*) ; Henna (Sierra Leone, *Barter*) ; Henna, (Katan, Hadramaut, *Lunt*) ; Maindee (India, *Hooker*) ; Jagive or Jagwi (Sierra Leone, *Scott Elliot*) ; Cumin (Siam, Mus. Kew).——Indian Privet, Egyptian Privet, Jamaica Mignonette, Réséda de Cayenne.

Lagos ; Kontagora ; Ilorin ; Borgu, and widely distributed in Upper Guinea and the Soudan, Persia, India, &c.

The powdered leaves are used as a dye for the finger-nails and hair by the women of various countries ; in Kontagora and Ilorin (Dudgeon, Herb. Kew ; N. Nig. Govt. Gaz. July 31st, 1909, p. 161), Borgu (Barter), Katan, Hadramaut, 1500 feet alt. (Lunt), Damascus (Hooker).

The leaves are ground in their raw state and mixed with lime juice (Fl. Trop. Afr. ii. p. 483); the Arab women dry and powder the leaves and young twigs, moisten with water for a few days, then boil the mass with more water for a few hours; the decoction is used diluted or otherwise according to the shade of colour desired, or the decoction may be evaporated and the dark-brown extract used (Pharm. Journ. [4] xxx. 1910, p. 670).

An ointment made of the leaves is used for wounds, bruises and ulcers (Safford, Pl. Guam, p. 320), and they are used for similar purposes and for leprosy in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 141).

Various medicinal uses are recorded for the several parts of the plant in India (*see* Watt, Dict. Ec. Prod. India).

The plant is easily cultivated from seed or cuttings, and is often used to make low fences or in the same way as box (*Buxus sempervirens*) edgings in this country; it stands cutting and grows compactly. Cultivated at various places along the Scarcies and the Talla plains, Sierra Leone, for local use (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 31).

Ref.—" *Lawsonia alba*," in Dict. Econ. Prod. India, Watt, iv. 1890 pp. 597–602.——" Henna (*Lawsonia alba*)," in New Comm. Pl. and Drugs, Christy, No. 7, 1884, pp. 50–51.——*Lawsonia inermis*, " Henna," in Useful Pl. of Guam. Safford (Contr. U. S. Nat. Herb. ix. 1905), pp. 306–307.——" Henna," in Pharm. Journ. [4] xxvi. 1908, p. 754.——" Use of Henna as a Hair Dye," l.c. xxxi. 1910, p. 722.

PUNICA, Linn.

Punica granatum, *Linn.;* Sp. Pl. (1753), p. 472.

Small tree, 15–30 ft. high. Leaves lanceolate or oblong, entire. Flowers red, in twos and fives at the tips of the branches. Fruit golden, tinged with red, about the size of an apple or orange, surmounted by the prominently persistent, leathery calyx, many-seeded; seeds embedded in a reddish pulp, sweet or slightly acid; rind thick and leathery.

Ill.—Rumpf, Amb. ii. t. 24; Gaertner, Fruct. Sem. Pl. i. t. 38; Good, Fam. Flor. ii. t. 66; Lam. Encycl. t. 415; Plenck. Ic. t. 376; Schk. Handb. t. 131b; Andr. Rep. ii. t. 96 (var. *flore albo*); Duhamel Traite des Arbres, iv. tt. 11, 11 bis; Bot. Mag. t. 1832; Desc. Ant. i. t. 35; Sibth. Fl. Gr. t. 476; Hayne, Darst. Beschr. Gewächse, x. t. 35; Nees von Esenbeck, Plant. Medic. Düsseld. t. 301; Guimpel, Abbild. Beschr. t. 89; Woodville, Med. Bot. iii. (1832) t. 190; Burnett, Pl. Util. i. t. 6a; Schnizlein, Ic. t. 269*; Wight, Illust. tt. 97, 97 bis, f. 1 (section of fruit); Berg & Schmidt, Darst. Beschr. Pharm. i. t. 3a (fl. br.), 3b (fr. & sections); Bentl. & Trimen, Med. Pl. t. 113; Köhler, Med. Pflan. ii.; Nicholson, Dict. Gard. iii. p. 252 (var. *flore pleno*); Pharm. Journ. [4]. xvii. 1903, p. 454 (single & double fl. & sect. of fr.); Temple, Fl. & Trees, Palestine, t. 27.

Pomegranate.

Native of S. Europe and W. Asia. Largely cultivated in the tropics and sub-tropics.

The fruit is one of the oldest known and is commonly imported to this country, though not in large quantities. The pulp is used in warm countries for making cooling drinks.

The bark is used for tanning—morocco leather is usually tanned with it.

The dried rind of the fruit is used medicinally in India for diarrhœa and dysentery ; the flowers possess astringent properties, and the root is anthelmintic.

The selected branches or young plants are used for making walking sticks, imported from Algeria (Howell & Co. Mus. Kew).

Grows freely from seed, which may be sown in Nursery beds, grown on in bamboo pots or planted out in permanent places when about 6 in. or a foot high. The plant makes a good fence, and for this purpose may be established by sowing seeds in position : putting in stout cuttings, or transplanting from the Nursery.

Under cultivation there are several forms differing more or less in the colour of the flowers both single and double, and therefore only of ornamental value.

Plants are distributed from the botanical department at Oloke-Meji.

Ref.—" Cortex Granati Fructus," in Pharmacographia, Flückiger & Hanbury, pp. 289–290.——" Cortex Granati Radicis," l.c. pp. 290–292, ——" *Punica Granatum*," in Med. Pl. Bentl. & Trimen, No. 113, 5 pages.——" *Punica Granatum*," in Dict. Econ. Prod. India, Watt, vi. 1892, pp. 368–372.——" Grenadier," in Les Drogues Simples d'origine vegétale, Planchon & Collin, ii. pp. 322–328.

ONAGRARIEAE.

TRAPA, Linn.

Trapa bispinosa, *Roxb.* ; Fl. Trop. Afr. II. p. 491.

Ill.—Rheede, Hort. Mal. xi. t. 33 ; Roxb. Pl. Corom. t. 234 ; Duthie, Field Crops, t. 98.

Vernac. names.—Birijin liam (Fufulde, *Dalziel*).—Singhara nut.

Yola (Dalziel, No. 67, 1909, Herb. Kew) ; Zambesi River, E. Africa (Kirk), occurs also in India and Ceylon.

An important article of food in Yola (Dalziel, Kew Bull. 1910, p. 141) ; Zambesi (Kirk, Herb. Kew, Mus. Kew) ; Lukugu River, E. Trop. Africa (Last, Mus. Kew) ; in Kashmir and India (Watt, Dict. Econ. Prod. India) etc. where found in sufficient quantities.

Cultivated in pools by Pagans, Yola (Dalziel, l.c.), and cultivated or found as an aquatic—usually in lakes, pools, tanks or comparatively sluggish water, everywhere.

Ref.—" *Trapa bispinosa*," in Field and Garden Crops of the N.W. Prov. and Oudh, Duthie & Fuller, iii. pp. 32–34.——" *Trapa bispinosa*," in Dict. Econ. Prod. India, Watt, vi. pt. 4, 1893, pp. 73–75.——" Indian Water Chestnut, *Trapa bispinosa*," Hooper, in Pharm. Journ. [3] xxiv. pp. 22–23 ; Abstract in Year Book of Pharmacy, 1894, pp 168–169 with analysis of powdered kernels.——" *Trapa bispinosa*," in Comm Prod. India, Watt, p. 1080.

Trapa natans, *Linn.* ; Fl. Trop. Afr. II. p. 491.

Ill.—Gaertner, Fruct. Sem. Pl. i. t. 26 ; Lam. Encycl. t. 75 ; Plenck, Ic. t. 66 ; Schk. Handb. t. 25 ; Sturm, Flora (*Onagrarieae*), Ann. Mus. Paris, xvi. (1810) t. 19 (en plaine germination) ; Bot. Reg. (1817) t. 259 ; Dict. Sc. Nat. t. 219 ; Nees von Esenbeck, Gen. Plant. Fl. Germ. iii. t. 215 ; Ann. Sc. Nat. Paris, ix. (1848) tt. 12–15 (anatomical); Journ. Bot. ii. (1873) t. 134; Gard. Chron. Aug. 17th, 1878, p. 212, f. 40; Bihang, Kongl. Svenska, Vetenskaps-Akad. xiii. No. 10, tt. 1–3; Rchb. Ic. Fl. Germ. xxiii. t. 26; Vilmorin-Andrieux, Pl. Potagères, p. 397 (pl. and fruit); Schinz, Mitt. Bot. Mus. Zurich, xxxvi. t. 20 (fruits).

Vernac. names.—M'beegeeree (Victoria Nyanza, *Grant*); Ling (China, *Hanbury*).—Water Chestnut, Jesuits' Nut, Water Caltrops, Marrons d'eau, Gnar Nuts.

A widely distributed plant; in Cent. Europe, Temp. Asia—China, Persia, &c. and extending to the Upper Nile, Chari (oriental, Mindjia et Mosouborta, *fide* Chevalier No. 7859, Herb. Kew) region and the Victoria Nyanza (Grant, Trans. Linn. Soc. xxix. 1875, p. 75) in Africa.

The seed is farinaceous and may be eaten raw, roasted, or in soups and forms an important article of food in the many countries where the plant is grown. The light brown skin covering the white kernel is also edible. Lega and Knez-Milojkovic have found these nuts to contain, water 37–39 per cent. nitrogenous matter 8–10, fat 0·7–0·8, carbohydrates 49, fibre 1·2–1·4, ash 1·2–1·4, and phosphoric anhydride 0·56 per cent. (Pharm. Journ. [4] xii. 1901, p. 485).

See T. bispinosa. The two plants appears to be doubtfully distinct; there are many intermediate forms differing chiefly in the fruit in which lies the main distinction between *T. bispinosa*—with two horns, and *T. natans*,—with four horns, at opposite angles.

Ref.—"Sur l'Anatomie et l'organogénie du *Trapa natans*," Marius Barnéoud, in Ann. des Sc. Nat. Series 3, ix. 1848, pp. 222–244.——"On *Trapa natans*": Especially the form now living in the Southernmost part of Sweden, Areschoug, in Journ. Bot. ii. 1873, pp. 239–246.——"Om de Fruktformer af *Trapa natans*, som Fordom Funnits I Sverige," Nathorst, in Bihang Till Kongl. Svenska Vetenskaps-Akademiens Handlingar, xiii. No. 10, Dec. 1887, pp. 1–40, illust. Pls. i–iii (fruits various forms), figs. 1–11 in the text (Stockholm, 1888).

PASSIFLOREAE.

OPHIOCAULON, Hook. f.

Ophiocaulon cissampeloides, *Mast.*; Fl. Trop. Afr. II. p. 518.

Ill.—Gard. Chron. Feb. 25th 1871, p. 234, f. 51.

Vernac. names.—Dodo (Ebute Metta, *Dawodu*).

Nupe (Barter No. 1663, Herb. Kew); Nun (Niger) River (Mann, No. 497 l.c.); Lagos (Millen, No. 33, Herb. Kew); found also in Sierra Leone; Gaboon; Fernando Po; Angola.

Used in Lagos to poison fish—the thick stems are half roasted, pounded and thrown into the water (Dawodu, Herb. Kew). The juice of the stem is used for smoothing the floors of huts in Sierra Leone (Scott Elliot, Herb. Kew).

The plant has some value for decorative purposes.

PASSIFLORA, Linn.

Passiflora edulis, *Sims*, Bot. Mag. t. 1989.

Leaves trilobed, glabrous, serrated. Flowers white, tinged with purple, fragrant. Fruit purple, ellipsoidal about 1½ in. in diameter, pulp orange coloured with somewhat the flavour of an orange.

Ill.—Bot. Reg. (1816) t. 152 (*P. incarnata*); Bot. Mag. t. 1989; Bot Reg. (1840) t. 52 (*P verrucifera*); Jacq. Eclogae Pl. Rar. ii. t. 124 (*P. rigidula*), t.169 (*P. rubricaulis*); Ann. de Gand, 1845, t. 35; Mart. Fl. Bras. xiii. pt. 1, t. 122, f. 1; Rev. Hort. 1857, p. 224; 1867, p. 390 (fruit); 1883, p. 489; Nicholson, Dict. Gard. iii. p. 30, f. 35; Gard. Chron. Feb. 12th, 1898, p. 101; Sept. 19th, 1903, p. 202.

Vernac. names.—Couzou (French Guiana, *Heckel*).—Purple-fruited Passion Flower, Mountain Sweet Cup.

Native of Brazil.

Fruit edible.

The leaves are used medicinally in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 109).

Easily grown from seed in moderately rich soil, and trained on trellis work or some similar support.

Ref.—"The Cultivation of the common Passion Vine, *Passiflora edulis*," and other species, Turner, in Agric. Gaz. N. S. Wales, ii. 1891, pp. 246–249.——"Woodiness of the Passion Fruit," Cobb, l.c. xii. 1901, pp. 407–418, illust.——"Manure for Passion Vines" in Queensland Agric. Journ. x. 1902, p. 39.

Passiflora foetîda, *Linn.*; Fl. Trop. Afr. II. p. 520 (no description).

Herbaceous climber; stems hispid. Leaves alternate, 3-lobed, cordate at the base, sometimes nearly entire, pubescent on both sides. Flowers single, axillary, with a moss-like involucre, whitish, the corona marked with purple and blue. Fruit small, yellowish, comparatively dry, in size, taste and appearance somewhat like a cape gooseberry.

Ill.—Cav. Diss. t. 289; Bot. Reg. (1818) t. 321; Lodd. Bot. Cab. t. 138 (*P. hirsuta*), t. 725; Bot. Mag. t. 2619; Desc. Ant. v. t. 375; Jacq. Eclogae Pl. Rar. ii. t. 122 ? (*P ciliata*), t. 123 ? (*P. hirsuta*).

Stinking Passion Flower, Wild Water Lemon.

S. Nigeria and West Africa in general. Cosmopolitan in the Tropics.

The leaves are used for poultices in inflammatory affections of the skin and the plant is said to have some value as an expectorant, as a remedy in hysteria and in female complaints (Treas. Bot. ii. p. 851).

Propagated by seeds or cuttings.

Some experiments have been made with this plant as a cover for ground in plantations, and to destroy "lalang grass" (*Imperata arundinacea*) and other weeds, in the Fed. Malay States, Ceylon and Borneo, with beneficial effect in soils that require to be kept continually moist. (Campbell, Agric. Bull. Str. & Fed. Malay States 1909, p. 447; Kelway Bamber, Roy. Bot. Gdn. Ceylon, Circ. No. 16, 1909, p. 141; N. Borneo Off. Gaz. Sept. 1st, 1911, p. 248).

Ref.—The cultivation of *Passiflora foetida* & *Mikania scandens* to keep down other weeds, Kelway Bamber, Roy. Bot. Gdn. Ceylon, Circ. No. 16, Feb. 1909, pp. 141–145.

Passiflora quadrangularis, *Linn.* Syst. ed. x. p. 1248.

Stem climbing, square, 4-winged. Leaves alternate, ovate, or subcordate, glabrous; petioles with 2 or 3 pairs of glands. Flowers solitary, opposite the petiole; Corolla-like lobes, white outside, red within; Calyx-like lobes, green without, white within; Corona white, variegated with violet; bracts entire. Fruit greenish-yellow, oblong, about 6 in. through; pulp succulent, edible, taste sweet though slightly acid. Seeds numerous.

Ill.—Cav. Diss. t. 283 ; Trans. Linn. Soc. ii. (1794) t. 3, f.a ; Bot. Reg. (1815) t. 14 ; Bot. Mag. t. 2041 ; Dict. Sc. Nat. t. 215 ; Desc. Ant. i.t. 60 ; Tuss. Ant. iv. tt. 10, 11 ; Geel, Sert. Bot. v.; Rchb. Exot. v. t. 304 ; Rev. Hort. 1898, p. 569, f. 195 ; 1902, p. 288 (var. *Decaisneana*).

Granadilla, Square-Stemmed Passion Flower.

Native of Tropical America. Commonly cultivated in the tropics of both hemispheres.

Fruits of this species are usually sold in the Paris Markets and they are occasionally seen in the London Markets.

The root is said to possess narcotic properties, used in Mauritius as a diuretic and emetic (Treas. Bot. ii. p. 851) ; regarded as a dangerous poison, and used as such by the natives of the Antilles (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 92).

Raised from seeds or cuttings ; cultivation easy, in moderately rich soil with ample rainfall and full exposure to sunshine. The plants require some support—poles or trellis work, but they will climb over anything on which the tendrils can twine themselves. The fruit-bearing branches should be pinched back occasionally, and pruning generally done during the growing season. For the reason mentioned by Heckel it is not advisable to plant it near cisterns or drinking water.

Cultivated for distribution by the Agricultural Department of S. Nigeria.

There are several Passifloras that could be grown either for their fruit or for ornament. *P. laurifolia*, "Jamaica Honeysuckle" or "Water Lemon," fruit edible, and *P. macrocarpa*, a strong climber, with fruits weighing 8 lbs. and upwards are commonly grown in hot countries.

CARICA, Linn.

Carica Papaya, *Linn.* Sp. Pl. (1753) p. 1036.

A small tree, 15 to 20 feet high, usually unbranched. Leaves alternate, palmatifid. Flowers dioecious, male white, female yellowish, produced in the axils of the leaves. Fruit nearly round or oblong, 8–12 in. long more or less furrowed, yellowish when ripe, many-seeded. Seeds small, mucilaginous, black.

Ill.—Rheede, Hort. Mal. i. t. 15 ; Rumpf, Amb. i. tt. 50-51 ; Desc. Ant. i. t. 47 ; Dict. Sc. Nat. t. 212 ; Bot. Reg. (1820-21) t. 459 ; Tuss. Ant. iii. tt. 10–11 (*Papaya sativa*) ; Bot. Mag. tt. 2898, 2899 ; Spach, Suites, (Hist. Nat. des Vegetaux) t. 50 ; Schnizlein, Ic. t. 200 ; Wight, Illust. tt. 106–107 ; Nooten, Fl. Java, t. 36 ; Martius, Fl. Bras. xiii. pt. 3, t. 49 ; Tschirch Ind. Heil, Nutzpfl. tt. 46, 47, 48 ; Köhler, Med. Pflan. iii ; Greshoff, Nutt. Ind. Pl. t. 43 ; Chicago, Field Columb. Mus. Bot. i. tt. 3–4 (habit. nat. and cult.) ; Agric. Gaz. N.S. Wales, 1898, p. 192 (tree three years old) ; Sargent Silva, N. America, xiv. t. 705 ; Karst. and Schenck, Veg. Bild. i. tt. 11, 18 (habit) ; Shattuck, Bahama Is. t. 33, f. 2 (habit) ; De Wildeman, Mission E. Laurent, p. clxxxii (fruits in various stages of development), clxxxiii (buds and young fruits) ; Teysmannia, Batavia, xix. 1908, p. 770 (habit) ; Pobeguin, Fl. Guin. Franç. t. 61 (habit) ; Freeman & Chandler, World's Comm. Prod. p. 278 ; Rechinger, Bot. Zool. Eng. Samoa, N. Guinea, Solomon Is. iii. p. 141 (habit).

Vernac. names.—Gwanda (Hausa, *Parsons*) ; Apapa, Broso, Ibbeh Kwee (Gold Coast, *Easmon*) ; [Papaya (Spanish) ; Lehoso (Mexico); Papai, Maneo, Mameiro (Brazil) ; Mamon (Paraguay) ; Papayo, Kapayo, or Capayo (Philippines); Esitarne (male), Esifafine—female (Samoa) *Safford*].——Papaw, Mummy Apple, Melon Tree.

The fruits may be eaten when ripe as dessert, cooked when young and green as a vegetable, or pickled in the green state.

Papain is the dried milk or juice of the fruit. It is not official in the British Pharmacopoeia though its value for medicinal purposes is recognized, and some importance has recently been given to it as well as to "Papayotin," in the treatment of malignant growths. Papayotin is prepared from Papain by a special process of purification, and its therapeutic activity is stated to be two or three times greater (*see* Merck's Ann. Rep. xxi. 1907, p. 186, for a record of these two forms of the drug applied to the cure of cancer).

The value of Papain may vary from about 6*d*. to 1*s*. an ounce. In the United States it has realized (1909) $4 to $6 per lb. (Philippine Agric. Rev. 1909, p. 178).

In Montserrat the peasants sell the thickened juice at the rate of ¾*d*. to 1*d*. an ounce (Agric. News, Barbados, ii. 1903, p. 35; Journ. Soc. Arts, li. 1903, p. 690).

It is obtained by scratching or lightly incising the green surface, somewhat after the manner of extracting opium from poppy heads. The receptacles in which it is collected should not be of metal, and the hands of the collectors require protection. Porcelain or glass-lined pans are recommended in the Philippines to evaporate the juice. The product when dry should be white and well granulated, in which state it is exported. (Philippine Agric. Rev. 1909, p. 178).

The peasants of Montserrat collect the juice in calabashes, into which a small quantity of water is first placed. As the juice falls into the water it thickens to the consistency of ice-cream (Agric. News, Barbados, ii. 1903, p. 35; Journ. Soc. Arts, li. 1903, p. 690). It is often carried in this state for some miles from the place where it is collected to the buyers who dry and ship the drug (Watts, W. Indian, Bull. vii. 1906, p. 7).

The best method of preparation is to mix the collected juice with twice its own volume of rectified spirit, filter the mixture after standing a few hours, dry at ordinary atmospheric temperature, powder and keep in stoppered bottles (Kew Bull. 1897, p. 107).

A similar method is recommended by Watt (Comm. Prod. India, *seq*.), and without the use of spirit, by Watts (Agric. News. Barbados, i. 1902, pp. 4–5), who further suggests sheets of glass or brown linen stretched on light wooden frames of a convenient size for drying, and an ordinary coffee grinder for reducing the substance to powder.

Propagated by seed. The cultivation is easy; plants flourish on rubbish heaps or any out of the way corners in the neighbourhood of native dwellings and farms, where they are usually self-sown. The tree grows rapidly and comes to maturity in about a year, but may be expected to bear green fruits before this, and to yield upwards of 50 fruits. A plot of 120 trees, 25 per cent. of which were males, yielded after about 7 months over 10 lbs. of juice (Agric. News, Barbados, ii. 1903, p. 35; Journ. Soc. Arts, li. 1903, p. 690). An average tree it is estimated will produce ¼ lb. of granulated juice (Philippine Agric. Rev. l.c.).

Ref.—"*Carica Papaya*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 158–164.——"*Carica Papaya*," in Med. Pflan. Köhler, iii. 6 pages.——"*Carica Papaya*," in Pharmacographia Indica, Dymock, Warden & Hooper, ii. pp. 52–59 (Kegan, Paul, Trench, Trübner & Co., London, 1891).——"*Carica Papaya*," in Nuttige Indische Planten, Greshoff, pp. 189–191 (J. H. De Bussy, Amsterdam, 1894).——"Papain as a Digestive Agent," Dott, in Pharm. Journ. [4] ii. 1896, p. 182.——"Papayer," in les Drogues Simples d'origine vègetale, Planchon, & Collin, ii. pp. 306–311.——"Report on a sample of the dried juice of *Carica Papaya*," Umney, Agric. Ledger, No. 31, 1896, pp. 1–6 (or of the series pp. 305–310); Reprint in Kew Bull. 1897, pp. 104–108.——"Fructification du Papayer a Marseille," Duvin, in Rev. Hort. 1900, pp. 480–481.——"*Carica Papaya*," in Med. Pl. Philippines, Pardo de Tavera, pp. 123–127 (Blakistons, Son & Co., Philadelphia, 1901).——"The Story of the Papaw," Kilmer, in American Journ. Pharm. lxxiii. 1901, pp. 272, 336, & 383; Reprint in Bull. Dept. Agric. Jamaica, i. 1903, pp. 181–189; ii. 1904, pp. 84–91, pp. 113–119, pp. 178–181.——"Preparation of Commercial Papain," Watts, in Agric. News, Barbados, i. 1902, pp. 4–5; Reprint in Pharm. Journ. [4] xiv. 1902, pp. 409–410.——"*Carica Papaya*," in Silva, N. America, Sargent, xiv. pp. 5–8——"*Carica Papaya*," in Comm. Prod. India, Watt, pp. 269–270.——"Papaw Juice," in Queensland Agric. Journ. xxiii. 1909, pp. 100–101, Pls. ix.–xii.——"Papaya Juice," in Philippine Agric. Rev. ii. 1909, p. 178, Pls. i.–v.

CUCURBITACEAE.

TELFAIRIA, Hook.

Telfairia occidentalis, *Hook. f.*; Fl. Trop. Afr. II. p. 524.

Ill.—Bot. Mag. t. 6272.

Vernac. name.—Krobonko (Gold Coast, *Tudhope*).

Yoruba—Abeokuta; Old Calabar, and throughout West Africa. Cultivated.

The seeds are cooked and eaten by the natives (Mann, Thomson), and have occasionally been imported as "oil-nuts" into England. The leaves are used as spinach (Moloney, Herb. Kew).

The fruit of this plant is remarkable amongst cucurbits for its size (24 in. × 10 in.) and number of large seeds ($1\frac{1}{4}$ in. across). The only other member of the genus (*T. pedata*, Hook.; Fl. Trop. Afr. ii. p. 523; Bot. Mag. tt. 2751–2) appears to be confined to East Africa, where it is likewise cultivated for the sake of the seeds as food. These seeds are suggested as being worth about £17 per ton in Europe for the extraction of oil (Cons. Rep. Ann. No. 4710, 1911, p. 7).

Propagated by seed. The plant is a perennial, and a lofty climber if allowed full development.

ADENOPUS, Benth.

Adenopus breviflorus, *Benth.*; Fl. Trop. Afr. II. p. 528.

Vernac. names.—Ito (Lagos, *Thompson*); Ditanga-Sese (Loanda, *Welwitsch*); Coloquintada bastarda (Loanda, *Welwitsch*); Pseudo Colocynthis or Pseudo Coloquinta (Golungo Alto).

Lagos; Borgu. Collected also at Sierra Leone (Vogel), Prince's Island, Angola, Loanda (Welwitsch), and in East Africa—Shire River (Kirk).

The Coloquinta of the shops in Golungo Alto (Hiern, Cat. Welw, Afr. Pl. ii. p. 391).

The true Colocynth is *Citrullus Colocynthis*, which does not appear to have been recorded from Nigeria.

LAGENARIA, Seringe.

Lagenaria vulgaris, *Seringe*; Fl. Trop. Afr. II. p. 529.

Ill.—Rheede, Hort. Mal. viii. tt. 1, 4, 5; Rumpf, Amb. v. t. 144 (*Cucurbita lagenaria*); Desc. Ant. v. t. 325 (*Cucurbita*); Wight, Illust. t. 105 bis; Rev. Hort. 1855, p. 61 (*L. microcarpa* fruit); Duthie, Field Crops, t. 48; Bull. Econ. Indo-Chine. 1905, p. 1213; L'Agric. prat. pays chauds, vii. i, 1907, p. 325; Queensland Agric. Journ. xxi. 1908, t. 33 (fruit); Fairchild & Collins, U.S. Dept. Agric. Bureau of Pl. Industry, Circ. No. 41, 1909, t. 1, f. 1 (Calabash pipe-gourds), f. 2 (young pipe gourds at the stage to begin the shaping process), t. 2 (materials & various forms of pipes).

Vernac. names.—Kabewa, Kworia, Butah, Gora, or Luddei (Katagum, *Dalziel*); M'booyoo (Unyoro, *Grant*); Bau-sau (Annam, *Lan*); Calebasse-terre (French Guiana, *Heckel*); Courge Calebasse Étranglée (Antilles, *Descourtilez*), Binda, Dinhungo (Golungo Alto, *Welwitsch*); Kan pio (Japan, *Ngai*); Yugao (Japan, *Hayashi*); Hiotan (Japan, *Matsumura*); Charrah (Arabia, *Loudon*).—Calabash, Pipe Calabash, Calabash Gourd, Siphon Gourd, Bottle Gourd, Club Gourd, White Pumpkin.

Katagum (Dalziel, No. 119, Herb. Kew). Cosmopolitan in the tropics and sub-tropics of both hemispheres. Cultivated.

The dried gourds are used for floats, bowls, water bottles and spoons, Katagum (Dalziel, Herb. Kew); Lagos (Millen, Rep. Bot. St. 30th Sept. 1895), and for every conceivable domestic purpose in the various parts of the world where it is grown, the remarkable variety in shape and size contributing largely to this general utility. Charcoal made from the shell is used in the preparation of lamp-black, for lac-turnery in India (Watt, Agric. Ledger, 1901, p. 338).

The prepared pulp of the fruit is edible in some of the varieties.

Loudon (Encycl. Pl. p. 808) states that the Arabians eat the fruit boiled, with vinegar, or fill the shell with rice and meat and thus make a kind of pudding of it, and that the pulp of the fruit is bitter and purgative, and may be used instead of "Coloquintida" (*Citrullus Colocynthis*). According to Balfour (Treas. Bot. ii. p. 656), the fruits are poisonous or at best of doubtful quality, although some of the numerous varieties have been eaten with impunity, and Heckel also states that the pulp surrounding the seeds is poisonous, and the juice violently purgative (Ann. Inst. Col. Marseille, iv. 1897, p. 100).

In Japan the gourd is used as food after being thoroughly dried—the ends of the fruit are cut off, the seeds and pulp taken out, the outer or fleshy part cut into very thin slices and dried by hanging on sticks. It will keep when dried for a considerable time in proper vessels, closed tightly (Nagai, Cat. Japan Inter. Health Exhib. London, 1884, p. 11, *q.v.* for analysis, Hayashi Journ. Roy. Hort. Soc. xxx. 1906, p. 24).

A variety "Dinhungo," with oblong fruit is eaten in Golungo Alto (Hiern. Cat. Welw. Afr. Pl. ii. p. 392).

The seeds have been used in French Guiana as a taenicide (Heckel, l.c.), and a decoction of the leaves in purging clysters (Loudon, l.c.).

Recently an important though perhaps limited trade in these gourds has arisen in S. Africa for the manufacture of pipes, for which purpose the plants are specially cultivated. The desired curve in the stalk usually develops naturally when the plants are grown on the ground, but artificial methods are occasionally resorted to. The soil recommended is alluvium, rendered porous by the admixture of lime (Kew Bull. 1907, p. 374). The fruit ripens in from 4 to 6 months, and may be cut when yellow or quite ripe, and dried.

The culture would be suitable under irrigation. See end of *Cucurbitaceae* for general cultural details.

Ref.—"*Lagenaria vulgaris*," in Field & Garden Crops, N. W. Prov. & Oudh, Duthie & Fuller, ii. pp. 48–49.——"*Lagenaria vulgaris*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 580–581.——"Courge Bouteille," in Les Pl. Potagères, Vilmorin Andrieux, pp. 219–221; Engl. Trans. Robinson, pp. 338–341.——"Calebasse," in L'Agric. prat. des pays chauds, vii. 1, 1907, pp. 324–328.——"Calabash Tobacco Pipes," in Kew Bull. 1907, p. 374.——The South African Pipe Calabash, Fairchild & Collins, U.S. Dept. Agric. Bureau of Pl. Industry, Circ. No. 41, 1909, pp. 1–9, illustrated.

LUFFA, Cav.

Luffa acutangula, *Roxb.*; Fl. Trop. Afr. II. p. 530.

Ill.—Grew, Rarities, Roy. Soc. t. 17, f. 2 (Indian Gourd, *Cucumis longus indicus*); Jacq. Hort. Bot. Vindob. iii. tt. 73, 74 (*Cucumis acutangulus*); Cav. Ic. i. tt. 9, 10 (*Luffa foetida*); Rheede, Hort. Mal. viii. t. 7; Rumpf, Amb. v. t. 149 (*Petola bengalensis*); Bot. Mag. t. 1638 (*L. foetida*); Vell. Fl. Flum. x. t. 93 (*Momordica Luffa*); Duthie, Field Crops, t. 62; Bull. Econ. Indo-Chine, 1905, p. 1201; L'Agric. prat. pays chauds, vii. 1, p. 250.

Vernac. names.—Karamui (Sierra Leone, *Scott Elliot*); Papengaye (Negro, *Naudin*, *Moloney*); Jhinga (India, *Watt*, *Bose*); Kali tori (India, *Duthie*).—Vegetable Sponge of the W. Indies, Strainer Vine, Luffa.

Tropical Africa; Asia, and throughout the Tropics.

Fruit used for washing, Sierra Leone (Scott Elliot, Herb. Kew), Jamaica (Fawcett, Econ. Pl. Jamaica, p. 51); the cultivated variety is used as a vegetable in India, but the wild variety is bitter and poisonous (Bose, Calcutta, Med. Journ. i. 1906, p. 73); used chiefly in curries, and as a vegetable, when half grown (Duthie, Field Crops, ii. p. 60), or not more than 4 in. long (Watt, Dict. Econ. Prod. India).

According to Naudin (Ann. Sc. Nat. Paris, Series 4, xii. 1859, p. 122) there are both bitter and poisonous, and edible sweet varieties and the plant readily hybridises with *Luffa aegyptiaca*.

Ref.—"*Luffa acutangula*," and "var. *amara*," in Dict. Econ. Prod. India, Watt, v. 1. 1891, pp. 94–96.——"Pipangaye," Desruisseaux, in L'Agric. prat. des pays chauds, vii. 1, 1907; "Cucurbitacéas Tropicales," pp. 248–252.

Luffa aegyptiaca, *Mill.*; Fl. Trop. Afr. II. p. 530.

Ill.—Rheede, Hort. Mal. viii. t. 8; Rumpf. Amb. v. t. 147; Wight, Ic. Pl. Ind. Or. ii. t. 499 (*Luffa pentandra*); Wight, Ill. t. 105 bis (*L. pentandra*); Duthie, Field Crops, t. 63; Med. Journ. Calcutta, i. 1906, t. 1 (bitter var.); De Wildeman, Pl. Util. Congo, ii. fasc. i. p. 131, f. 8 (*L. cylindrica*, fruit deprived of pulp & seeds).

Vernac. names.—Tita Dhoondool—bitter variety (India, *Rai Chuni Lal Bose*); Beng Dhoondool—edible variety (India, *Bose*).—Soolay Qua, Loofah, Towel Gourd, Bonnet Gourd, Dish Cloth Gourd, Vegetable Sponge.

Niger (Vogel, Barter). Tropics generally.

The dried net-work of the fruit is used largely for washing purposes, like sponges; for making brushes and boot-socks.

The fruits are gathered when turning ripe, dried under cover in a free current of air, skinned, the seeds removed, and baled. They usually come into commerce pressed flat in the bales, which contain from 1200 to 5000, according to the size of the loofahs (from 10 to 20 inches long), sold when filled out again at from about 12*s.* to 72*s.* a gross. The supplies come chiefly from Japan.

The fruits when young are eaten as a vegetable in Japan, India (Watt, Duthie) and other eastern countries. There is a bitter variety which possesses toxic principles, indistinguishable from the edible form, except that the fruits are darker in colour and the taste extremely bitter (Bose, Culcutta, Med. Journ. i. 1906, p. 66).

Ref.—"*Luffa aegyptiaca*," in Dict. Econ. Prod. India, Watt, v. 1, 1891, pp. 96–97.——"*Luffa cylindrica*," in Pl. Utiles du Congo, De Wildeman, ii. fasc. i. Art. vi. pp. 130–132 (Spineaux & Co. Bruxelles, 1906).——"The Toxic Principles of the Fruits of *Luffa aegyptiaca* (Bitter variety)," Rai Chuni Lal Bose, Bahadur, in Calcutta Medical Journ. 1st Sept. 1906, pp. 65–72, with a table of the more important plants in Cucurbitaceae and their Uses, pp. 72–74.——"Where Loofahs Come From," in Pharm. Journ. [4] xxxii. 1911, pp. 271–272, illustrated, method of cultivating plants suspended on poles, gathering, curing and cleaning loofahs.——"The Preparation of Loofahs for the Market," in Agric. Journ. Cape of Good Hope, xxxvii. Dec. 1910, pp. 651–652; Abstract in Agric. News, Barbados, x. 1911, p. 84.

BENINCASA, Savi.

Benincasa cerifera, *Savi.*; Fl. Trop. Afr. II. p. 532.

Ill.—Rheede, Hort. Mal. viii. t. 3 (*B. hispida*, Cumbulain); Jacq. Eclogae Pl. Rar. ii. tt. 153, 154, tt. 155, 156 (*B. cylindrica*); Rev. Hort. 1887, p. 540; Duthie, Field Crops, t. 45; Vilmorin-Andrieux, Pl. Potagères, p. 37.

Vernac. names.—[Condol or Kondol (Philippines); Condor or Kondot (Guam) *Safford*]; Togan (Japan, *Hayashi*).—Wax Gourd, Ash Pumpkin, White Gourd, White Gourd Melon.

N. Nigeria (Watson, Herb. Kew). Cultivated in other parts of Africa, in India, China, Philippines, Japan and most warm countries.

The fruit is commonly eaten as a vegetable, like the vegetable marrow; a favourite on the table, Japan (Hayashi, Journ. Roy. Hort. Soc. xxx. 1906, p. 23); used in curry, and made into a sweetmeat (Dict. Econ. Prod. India). Various medicinal uses are attributed to it in India (l.c.).

The gourd is covered with a white waxy substance, suggested for the manufacture of candles (Watt, Comm. Prod. India, p. 130).

Ref.—"*Benincasa cerifera*," in Field & Garden Crops, N. W. Prov. & Oudh, Duthie & Fuller, ii. pp. 43–44 (Thomason Civil Engineering College Press, Roorkee, 1883).——"*Benincasa cerifera*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 439–441.

CLADOSICYOS, Hook. f.

Cladosicyos edulis, *Hook. f.*; Fl. Trop. Afr. II. p. 534.

Aboh (Barter No. 483, Herb. Kew). Also recorded from Sierra Leone, Angola, and Monbuttu, East Africa.

Fruit edible (Barter, l.c.); root poisonous (Bates, Herb. Kew).

MOMORDICA, Linn.

Momordica balsamina, *Linn.*; Fl. Trop. Afr. II. p. 537.

Ill.—Lam. Encycl. t. 794 (*Momordica*) f. 1; Dict. Sc. Nat. tt. 208, 209; Gard. Chron. April 22nd, 1848, p. 271; Rev. Hort. 1857, p. 182, f. 75; 1859, p. 631, f. 135 (fruit).

Vernac. names.—Garafini (Katagum, *Dalziel*)—Balsam Apple.

Katagum. Widely distributed in the tropics and sub-tropics. Cultivated in America.

The leaves are used as soap in Katagum (Dalziel, Herb. Kew). An infusion of the fruit in olive or almond oil is applied to chapped hands, burns, old sores, &c., and the fruit mashed is sometimes used in the form of a poultice (Gard. Chron. April 22nd, 1848, p. 271; Wood & Bache, Disp. U.S. America, 1854, p. 1361); used also for the cure of wounds in Syria—cut open when unripe, infused in sweet oil, and exposed to the sun for some days until the oil becomes red (Loudon, Encycl. Pl. p. 808; Moloney, For. W. Afr. p. 359; Dict. Econ. Prod. India).

Momordica Charantia, *Linn.*; Fl. Trop. Afr. II. p. 537.

Ill.—Commelin, Hort. Med. Amstel. Pl. i. t. 54 (*Balsamina cucumerina indica*); Rheede, Hort. Mal. viii. t. 9; Rumpf. Amb. v. t. 151 (*Amara indica*); Lam. Encycl. t. 794 (*Momordica*), f. 2; Bot. Mag. t. 2455; Bot. Reg. (1826) t. 980 (*Cucumis africanus*); Wight, Ic. Pl. Ind. Or. ii. t. 504; Wight, Illust, t. 105 bis; Fl. des Serres, t. 1047; Rev. Hort. 1859, p. 630, f. 134, p. 631, f. 135A; Duthie, Field Crops, t. 64; L'Agric. prat. pays chauds, vii. i, p. 321; Thonner, Blütenpfl. Afr. t. 148; Rechinger, Bot. Zool. Eng. Samoa, N. Guinea, Solomon Is. iii. p. 206 (habit).

Vernac. names.—Ejirin (Lagos, *MacGregor*, *Dawodu*, *Punch*); Ako Ejirin (Yoruba, Oshogbo, *Moloney*, *Millson*); Garafini (Nupe, *Barter*); Margose (Mauritius, *Johnston*); Cundeamor (Porto Rico, *Cook & Collins*); Kakorah (Jhelum, *Aitchison*); Karelu (Saharanpur, *Duthie*); [Cundeamor (Cuba, Porto Rico); Ampalia (Philippines); Balsamina, Amargosa (Spanish) *Safford*]; [Cerasee (Jamaica); Condeamor (Venezuela) *Moloney*]; Sorossi (French Guiana, *Heckel*). ——Balsam Apple, Balsam Pear, African Cucumber, Tuberculated Momordica.

Lagos; Yoruba; Nupe; Kouka [Kuka]. Widely distributed in the tropics. Cultivated throughout India.

The fruit is described as bitter, but not unwholsome. It is recommended to be steeped in salt water before cooking (Moloney, For. W. Afr. p. 358; Safford, Pl. Guam, p. 326). Eaten in curries, or sliced and dried, in India (Dict. Econ. Prod. India). The tuber is eaten by the natives, Jhelum District (Aitchison, Mus. Kew).

A decoction of the leaves is used as a stomachic, in Lagos (Punch, Herb. Kew); said to be used as a substitute for hops by the Dutch (Watson, Gard. Mag. Dec. 15, 1894, p. 759).

Medicinally the plant is used much like *M. balsamina*, French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 144); Guam (Safford, l.c.); and in India (Watt, Dict. Econ. Prod.), various medicinal uses are attributed to all parts of the plant.

Under cultivation there are several varieties known. In India two are distinguished as the rainy season variety ("Kareli") and the dry season variety ("Karela") (Duthie, *seq.*).

See end of *Cucurbitaceae* for cultural details.

Ref.—"*Momordica Charantia*," in Field and Garden Crops, N.W. Prov. & Oudh, Duthie & Fuller, ii. pp. 62–63.——"*Momordica Charantia*," in Dict. Econ. Prod. India, Watt, v. i. 1891, pp. 256–257.——"Margose," Desruisseaux, in L'Agric. prat. des. pays chauds, vii. i. 1907, pp. 320–324.

CUCUMIS, Linn.

Cucumis Figarei, *Delile*; Fl. Trop. Afr. II. p. 543.

Ill.—Rich. Tent. Fl. Abyss. t. 53 bis (*C. ficifolius*).

Vernac. names.—Makaimi (Katagum, *Dalziel*); Shishibia (Loanda, *Gossweiler*).

Fruits edible, Loanda (Gossweiler, Herb. Kew).

Cucumis Melo, *Linn.*; Fl. Trop. Afr. II. p. 546.

Vernac. names.—Qaoon (Egypt, *Brown*); Makuwari (Japan, *Woolley*); Kurbooja (Madras, Mus. Kew).—The Melon, Sweet Melon, Musk Melon, Nutmeg or Netted Melon, Cantaloup.

Native probably of Bokhara. Cultivated throughout China (Fl. Sinensis, i. p. 317) and in many warm countries.

The Melon is well known as a dessert fruit. There are many cultivated forms varying in the form—usually round, but sometimes oblong or oval; the surface smooth, ribbed, or netted; colour and flavour of their flesh—white, green, red, or flesh-colour; the seeds yield about 30 per cent. of light thin slow-drying oil; employed in the soap industry and for culinary purposes (Watt, Comm. Prod. India, p. 438). The seed is one of the principal exports from Kiukiang, China—46,774 cwts., value £39,057, in 1906, and 30,345 cwts., value £29,492, in 1907 (Cons. Rep. Ann. No. 4031, 1908, p. 12), and a considerable trade in it exists from the Chinese port of Chefoo (Watt, l.c.).

Melons have been grown at Ibadan (Ricketts, S. Nig. Govt. Gaz. 3rd March, 1909, Suppl. p. 11), and it is probable that they would grow well in all the drier parts of the two Colonies. The plant succeeds well under irrigation and requires a hot dry climate and rich sandy soil. The returns from an acre of Melons in Egypt vary between £20 and £40, and the expenses of cultivation do not exceed £10 (Brown, Journ. Roy. Hort. Soc. xxxv. 1909, p. 35).

Var. **agrestis**, *Naud.* in Ann. Sc. Nat. Series 4, xi. (1859), p. 73.

Vernac. names.—Ajurr—bitter Senat, Fagus—sweet Senat (Kordofan, Mus. Kew); Hameid (Berber, Sudan, Mus. Kew); Boange (Nupe, *Barter*); Gurji (Sokoto, *Dalziel*).

Nupe; Borgu (Barter, No. 748, Herb. Kew).

An oil seed, the export of which from the Sudan in 1910, amounted to 110 tons, and the seed is now under investigation (Bull. Imp. Inst. 1911, p. 63). It appears probable that this is Barter's "boange" of the Nupe people—he describes the fruit as, size of a walnut, edible, of the flavour of a green melon; grows in dry sandy places, Nupe and Borgu. Used in soup, Sokoto (Dalziel, Herb. Kew).

Ref.—"*Cucumis Melo*," in Field & Garden Crops, N.W. Prov. & Oudh, Duthie & Fuller, ii. pp. 51–52.——"Melon (*Cucumis Melo*)," in Dict. Gard. Nicholson, ii. pp. 348–351.——"*Cucumis Melo*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 627–632, including var. *Momordica*, and var. *utilissima*.——How to grow Melons for Market, Burpee, pp. 1–81, illustrated.——"How to Grow Melons," Queensland Agric. Journ. iii. 1898, p. 479.——"Melon," in Vegetables & Flowers, Trop. Sub-Trop. & Temp. Climates, Sutton & Sons, pp. 72–75.——

Experiments with Musk melons, Rane, New Hampshire College, Agric. Exp. St. Bull. No. 70, 1900, pp. 15–44, with figures of fruits of 95 varieties.——Musk melons, Craig, Cornell Univ. Agric. Exp. St. New York, Bull. No. 200, 1902, pp. 158–176, with descriptions of 70 varieties, illustrated.——"Melon, *Cucumis Melo*," in Les Pl. Potagères, Vilmorin-Andrieux, pp. 403–425 (Paris, 1904); English Translation, Robinson, pp. 411–432.——"Le Melon Sauvage et la Culture des Melons en Asie Centrale," Barsacq, in Le Jardin, xx. 1906, pp. 213–216.——"*Cucumis Melo*," in Comm. Prod. India, Watt, pp. 437–439.——Commercial Melon Growing, Troop & Woodbury, Purdue Univ. Agric. Exp. St. Indiana, Bull. No. 123, 1908, pp. 1–23, illustrated.

Cucumis metuliferus, *E. Mey.*; Fl. Trop. Afr. II. p. 543.

Ill.—Rev. Hort. 1860, p. 188; Kotschy, Pl. Tinneanea, t. 8 (*C. Tinneanus*); Bot. Mag. t. 8385.

Vernac. names.—Nonon Kura (Katagum, *Dalziel*).—Concombre metulifere.

Niger River; Borgu. Recorded also from Abyssinia, Angola, Shire River (E. Africa), Natal, Pondoland, &c.

The fruits are olive green, ripening to rich scarlet and highly ornamental (Bot. Mag. l.c.). According to Barter (No. 1527, Herb. Kew) they are too bitter to be used; found in cultivated ground, Borgu.

Cucumis Prophetarum, *Linn.*; Fl. Trop. Afr. II. p. 545.

Ill.—Schk. Handb. t. 315.

Vernac. names.—Kam-fakara (Katagum, *Dalziel*); Ta-meer-umboi (Abyssinia, *Rohr*).

Fruit bitter (Fl. Trop. Afr. l.c.). Used as an emetic, and in small doses with honey as a stomachic for children (Moloney, For. W. Afr. p. 359); believed to possess antisyphilitic properties (Rohr, Herb. Kew). Found in waste places as a ground trailer, Katagum (Dalziel, Herb. Kew).

Cucumis sativus, *Linn.*; Fl. Trop. Afr. II. p. 542.

Vernac. names.—Khiyar (Arabic, *Brown*).—The Cucumber.

Tropical Africa, cultivated.

Used green for salads and pickles. In Russia there is a small gherkin cucumber about the size of a goose's egg ("Concombre de Russie," Vilmorin-Andrieux, Pl. Potagères, p. 186) which is pickled very largely (Queensland Agric. Journ. ix. 1901, p. 511); the method being to immerse the cucumbers in strong brine for a month or six weeks, when they are taken out, graded, and packed in jars or tubs, finding a ready market at a price which pays the grower better than the fresh fruits (l.c. viii. 1901, p. 436). "Boston Pickling" or "Green Prolific" is largely used in America in the same way (Vilmorin-Andrieux, *seq.* p. 197).

Cucumbers grow well all the year round, Oloke-Meji (Foster, S. Nig. Govt. Gaz. Oct. 21st, 1908, Suppl. p. 1); thrive splendidly in Zaria, and grown in Bornu (Parsons, N. Nig. Gaz. 30th April, 1910, p. 101); grown successfully in Old Calabar, fruiting freely during April, May, June, and July (Report, Bot. Gdn. Old Calabar, 1900–1901). Cultivated by the Arabs, Cent. Africa (5° S.) (Grant, Trans. Linn. Soc. xxix. 1875, p. 78).

There are many good varieties under cultivation. Vilmorin-Andrieux (*seq.*) describes 50 kinds, and Tracy (U.S. Dept. Agric. Bureau Pl. Ind. Bull. No. 21, 1903. pp. 167–182) enumerates no less than 339 varieties—though many of these are synonymous—catalogued by seedsmen in the United States and Canada.

Ref.—"*Cucumis sativus*," in Field & Garden Crops, N.W. Prov. & Oudh, Duthie & Fuller, ii. pp. 53–54.——"*Cucumis sativus*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 632–635.——"Cucumber Growing and Pickle Making," in Queensland Agric. Journ. vii. 1900, pp. 294–295.——"Cucumber," in Vegetables & Flowers, Trop. Semi-Trop. & Temp. Climates, Sutton & Sons. pp. 52–56.——"Concombre, *Cucumis sativus*," in Les. Pl. Potagères, Vilmorin-Andrieux, pp. 181–198 (Paris, 1904); English Translation, Robinson, pp. 264–284 (John Murray, London, 1905).——"Cucumbers," Harris, in Bull. Dept. Agric. Jamaica, iv. 1906, pp. 219–220.——Cucumbers, Corbett, U.S. Dept. Agric. Farmers' Bull. No. 254, 1906, pp. 1–30.

CITRULLUS, Schrad.

Citrullus vulgaris, *Schrad.*; Fl. Trop. Afr. II. p. 549.

Vernac. names.—Goonah (Katagum, *Dalziel*); Kankana (Hausa, *Parsons*); Egusu (Nupe, *Barter*); Egusi Bara (Oloke-Meji, Lagos, *Johnson*, *Dawodu*); Ikpan (Lagos, Bull. Imp. Inst. 1907, p. 356); Beraf (Senegal, *Moloney*); Voakètsihètsy (Madagascar, *Parker*); Tendsee (Saharunpur, *Duthie*); Tarbooj (Ahmedabad, Mus. Kew); Laikee or Argosee? (Sierra Leone, *Oldfield*)—The Water Melon, Canadian Citron, Citron Water Melon, Tsama Water Melon.

Katagum; Nupe. Common in the Kalahari region, and widely distributed in warm countries. Said to be indigenous in equatorial Africa.

The fruit is well known for its watery refreshing pulp when ripe, and as a vegetable when green. The Citron Water Melon is usually made into a preserve or sweetmeat called "Citron." In Ngamiland it is eaten by bushmen, often their sole supply of water, and it is also of equal value to the antelopes (Lugard, Herb. Kew). According to Mac Owan, the waterless regions of the Kalahari would be impassable but for the perfectly tasteless watery contents of the "Tsama water melon." This variety is also readily eaten by cows and horses (Kennedy, U.S. Dept. Agric. Div. Agrost. Bull. No. 22, 1900, p. 85).

Large supplies of water melons come into the markets of this country from Spain and Portugal.

The seeds are eaten as food in Lagos and other parts of Nigeria, being commonly sold in the native markets; used for making a kind of sauce in Sierra Leone (Scott Elliot, Mus. Kew); ground and made into soup, sometimes into cakes, Lagos (Gurney, Mus. Kew); used as food and an oil called "Ecose" prepared from them in Lagos (Venn, Mus. Kew); parched for eating, Kiukiang (Bullock, Mus. Kew). They have been found by Lidoff (seeds grown in S. Russia) to contain from 24 to 25 per cent. of oil suitable for lubricating purposes (Journ. Soc. Arts, xxxii. 1884, p. 1076), and soap-making, valued (1908, seeds grown in S. Nigeria) at £21 10*s.* to £23 10*s* per ton (Col. Rep. Ann. No. 630, 1909, p. 39).

Power and Salway (seeds from the United States) have found the whole seed, when ground and extracted with light petroleum to yield 19 per cent of fatty oil, and the kernels, obtained by expression, 7·4 per cent of oil (No. 105, *seq.* p. 373).

There are several varieties under cultivation, with yellowish, white, or red flesh, varying in form from spherical to ovoid, 4 to 8 inches in diameter, sometimes more than 10 inches across and 20 inches long, averaging upwards of 20 lbs. in weight. A common sort, in all probability the same, which appears to be grown in many hot countries, under the names of "Tsama water melon"—native of the Kalahari desert, round fruit, 4 in. or more in diameter, in quality equal to "pie," "stock," or "citron" melon, found capable of yielding at the rate of 22 tons of fruit per acre, in California, or planted 15 ft. by 15 ft., the general yield per acre may be expected to be about 40,000 lbs. (Kennedy, U.S. Dept. Agric. Div. Agrost. Bull. No. 22, 1900, p. 85); "Goonah"—fruit globular, 4 in. diam.: variegated, dark and bright green longitudinally, turning white or yellowish, sometimes cultivated, Katagum (Dalziel, Herb. Kew); fruit size of a green-flesh-melon, intensely bitter, "yields the "egusu" seeds of Dr. Baikie's last voyage," trailing in cultivated ground, Nupe (Barter, Herb. Kew); the common "Kalahari Melon" —fruit mottled, yellow and green, ground creeper, Kwebe Hills (3300 ft.), Ngamiland (Lugard, Herb. Kew); "Voakètsihètsy"—a globular melon, with white stripes, running from pole to pole, Madagascar (Parker, Herb. Kew), and a plant with a similar fruit has been grown at Old Calabar. Water melons have been grown at Zaria (Parsons, N. Nig. Gaz. 30th April, 1910, p. 101).

A very important crop in Egypt, sown on large areas both on the river banks and inland. The returns from an acre vary between £20 and £40, and the expenses do not exceed £10 (Brown, Journ. Roy. Hort. Soc. xxxv. 1909, pp. 33, 35). See end of *Cucurbitaceae* for general details of cultivation.

Ref.—"On Eguse Oil: A New Vegetable Product from S. Africa," Daniell, in Pharm. Journ. [1] xvi. pp. 307-309.——"*Citrullus vulgaris*," in Field & Garden Crops, N.W. Prov. & Oudh, Duthie & Fuller, ii. p. 56.——"*Citrullus vulgaris*," in Dict. Econ. Prod. India, Watt, ii. 1889. pp. 331-333.——Water Melons and Cantaloupes. Newman & Clayton, Alabama, Agric. Exp. Station, Bull. No. 28, 1891, pp. 1-11.——"Tsama Water Melon (*Citrullus vulgaris* var.)," Kennedy, U.S. Dept. Agric. Div. of Agrostology, Bull. No. 22, 1900, pp. 85–86.——"Some Selected Melons," Jackson, in Agric. Gaz. N.S. Wales, xi. 1900, pp. 678–682. Plates 9.——Growing Water Melons in the North, and Classification of Water Melons, Rane, New Hampshire Coll. Agric. Exp. St. Bull. No. 86, 1901, pp. 69–107, illustrated.—"Melon d'eau Pasteque," in Pl. Potagères. Vilmorin-Andrieux, pp. 426–429; English Translation, Robinson, pp. 432-436.——"Ikpan Seeds from S. Nigeria," in Bull. Imp. Inst. v. 1907, pp. 132-134; l.c. vi. 1908, pp. 356–357.——"Chemical Examination of Water Melon Seed," Power & Salway, No. 105, Wellcome Chemical Research Laboratories; Reprint from Journ. American Chemical Soc. xxxii. March, 1910, pp. 360–374.

CEPHALANDRA, Schrad.

Cephalandra indica, *Naud.*; Fl. Trop. Afr. II. p. 550.

Ill.—Rheede, Hort Mal. viii. t. 14 (*Coccinea indica*): Cambessides, Pl. Rar. Jacquemont, t. 72 (*Coccinea indica*); Hook. Ic. Pl. t. 138 (*Coccinea indica*); Wight, Illust. t. 105* (*Coccinea indica*).

Katagum (Dalziel, No. 114, 1908, Herb. Kew): Confluence of

Kworra [Niger] and Tchadda [Benue] (Barter, Herb. Kew). Found also in Abyssinia, Nubia, Upper Nile, Zanzibar, India, Java &c.

The fruit is eaten both raw and cooked, fresh when ripe, and in curries and as a vegetable when green. Various medicinal uses are attributed to all parts of the plant in India (Watt, Dict. Econ. Prod. India).

CUCURBITA, Linn.

Cucurbita maxima, *Duchesne* ; Fl. Trop. Afr. II. p. 555.

Vernac. names.—Qara Soudani (Egypt, *Brown*) ; Maboga, Matagararreh (Unyoro, *Grant*) ; Mirango (Mandingo, *Dudgeon*) ; Laket (Joloff, *Dudgeon*) ; Calabacita cimerrona (Tabasco, *Rovirosa*).—Calabash Gourd, Melon Pumpkin, Squash Gourd.

Nupe (Barter, No. 1526, Herb. Kew). Gambia ; Angola ; Nile Land ; Abyssinia, and cultivated in many hot countries, probably throughout the world.

Cultivated, sides of hills, but not confined to cultivated ground, Nupe (Barter, l.c.) ; grown irregularly as a field crop, Gambia, and exported in large numbers from the upper river to Sierra Leone (Dudgeon, Rep. Agric. and Forest Prod. Gambia, Govt. Gaz. 5th March, 1910, p. 114).

These gourds are used for various domestic purposes and are often handsomely carved. Sometimes 2 ft. and upwards in diameter.

The seeds yield an oil called "Pushini-Kaia" (Col. and Ind. Exhib. Mus. Kew).

Extensively used by the natives of Unyoro,—leaves, male flowers, seeds and fruit being cooked and eaten (Grant, Trans. Linn. Soc. xxix. 1875, p. 77) ; eaten when young and green as a vegetable in India (Dict. Econ. Prod. India).

Ref.—"*Cucurbita maxima,*" in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 638–640.——Pl. Potagères, Vilmorin-Andrieux, pp. 201–210.

Cucurbita moschata, *Duchesne* ; Fl. Trop. Afr. II. p. 556.

Vernac. names.—Qara Stambouly (Egypt, *Brown*) ; Tonasu (Japan, *Hayashi*).—Mush Gourd, Portmanteau Gourd, Potiron, Naples Gourd.

Cosmopolitan in the tropics. Cultivated in Abyssinia.

Used as a vegetable throughout India (Dict. Econ. Prod. India).

Various medicinal uses are attributed to the plant in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 115).

Ref.—"*Cucurbita moschata,*" in Field and Garden Crops, N.W. Prov. and Oudh, Duthie & Fuller, ii. pp. 58–59.——"*Curcubita moschata,*" in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 640–641.

Cucurbita Pepo, *DC.* ; Fl. Trop. Afr. II. p. 556.

Vernac. names.—Sakribonti (Accra, *Easmon*) ; Effehn (Fanti, Gold Coast, *Easmon*) ; Cosa Standarani, Cosabeda—Vegetable Marrows, Qara Magreby—Pumpkin (Egypt, *Brown*)—The Pumpkin, Vegetable Marrow (sometimes distinguished as var. *ovifera*).

Cultivated in many hot countries.

Pumpkins and vegetable marrows, cooked and uncooked, are excellent for the table. Pumpkins are also considered good food for pigs and cattle.

The seeds are eaten cooked, with Katwe salt, by the Baamba Natives, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 22) ; cracked small they are recommended for feeding poultry (Queensland Agric. Journ. viii. 1901, p. 36). They are regarded as an efficient and harmless taenifuge by the United States Pharmacopoeia, but experiments conducted at the Wellcome Chemical Research Laboratories do not confirm the recorded statements respecting the efficacy of either the fatty oil or the resin of the pumpkin seed as a taenifuge, the action is suggested as mechanical and their remedial value is not sufficient to justify recognition by a national pharmacopoeia (Power & Salway, No. 104, *seq.* p. 359).

Dried and powdered pumpkin is used in the process of preparing leather for tanning on the Gambia (Dudgeon, Gambia Govt. Gaz. 6th March, 1909, p. 127).

As shewing the value of this plant as a field crop, 2 acres have been found to yield [in Queensland] 7500 table pumpkins, in six months, irrigated every third week, to augment a trifling rainfall. The market value of the crop was £93 15*s.* (625 dozen at 3*s.*) giving a return of £46 17*s.* 6*d.* per acre (Queensland Agric. Journ. xiii. 1903, p. 3).

For cultivation see end of this Order.

Ref.—"*Cucurbita Pepo*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 641–642.——"Pumpkins," in Queensland Agric. Journ. ii. 1898, pp. 357–358.——"Vegetable Marrow (*Cucurbita Pepo ovifera*)," in Vegetables and Flowers, Trop. Semi-trop. and Temp. Climates, Sutton & Sons, pp. 113–115.——"Chemical Examination of Pumpkin Seed," Power & Salway, No. 104, Wellcome Chemical Research Laboratories; Reprint from Journ. American Chemical Soc. xxxii. March 1910, pp. 346–360.——Pl. Potagères, Vilmorin - Andrieux, pp. 213–219.

MUKIA, Arn.

Mukia scabrella, *Arn.*; Fl. Trop. Afr. II. p. 561.

Ill.—Rheede, Hort. Mal. viii. t. 13; Wight, Ic. Pl. Ind. Or. ii. t. 501 (*Bryonia scabrella*); Wight, Illust. ii. t. 105*.

Vernac. name.—Ori-oka (Lagos, *MacGregor*).

Lagos; Nupe.

Used medicinally in Lagos (MacGregor, Herb. Kew); the tender shoots and bitter leaves used as a gentle aperient, a decoction of the seeds as a sudorific, of the root for flatulency, and when chewed relieves toothache (Dict. Econ. Prod. India).

Found in Yam fields—one plant 8–10 ft., fruit red when ripe, one 4–6 ft., fruit yellow when ripe, Nupe (Barter, Nos. 1520, 1076, Herb. Kew).

SECHIUM, P. Browne.

Sechium edule, *Swartz*, Fl. Ind. Occ. ii. p. 1150.

Root-stock, perennial, large, amorphous, fleshy, somewhat like a yam (*Dioscorea sativa*); Stem annual. Leaves membranous, cordate, lobed. Inflorescence racemose. Flowers yellow, monoecious. Fruit fleshy, 3–5 inches long, obovoid, oblong or pear shaped, furrowed, one seeded.

Ill.—Jacq. Icon. Select. Stirp. Am. t. 163 (*Sicyos edulis*); Desc. Ant. v. t. 328 (*Cucumis acutangulus*); Gard. Chron. Jan. 21st, 1865, p. 51 (fruit); Mart. Fl. Bras. vi. pt. 4, t. 35; Agric. Gaz. N.S. Wales, iv. 1894, t. 28; Rev. Hort. 1900, p. 420; Gard. Chron. Dec. 22nd, 1900, p. 450; Cook, U.S. Dept. Agric. Div. Bot. Bull. No. 28, 1901, tt. 1–8; Queensland, Agric. Journ. xv. 1904, p. 621 (Frontispiece); l.c. t. 6 (varieties of fruit); L'Agric. prat. pays chauds, vii. 1, 1907, pp. 7, 9; Tropenpfl. xi. 1907, p. 704, ff. 1, 2.

Vernac. names.—Pepinella (Madeira, *Lowe*, *Cook*); Chuku (Brazil, *Martius*); Chocho (Jamaica, *Lunan*).—Choko, Chayote, Christophine, Vegetable Pear, Chow Chow, Madeira Marrow, One-seeded Cucumber.

Native of the W. Indies. Commonly cultivated in the Tropics.

Fruit eaten as a vegetable. The tuberous roots are edible, starch made from them is recommended as a substitute for Arrowroot (*Maranta arundinacea*), and the young shoots may be eaten cooked, like Asparagus.

The green vines are good fodder, and the ripe stems contain a strong straw like fibre used for making fancy basket work and ladies' hats in Paris, and Algeria.

This plant is mentioned in the list of plants grown at Ebute Metta in 1892 (Rowland & Millen) but no further particulars appear to be available. It is, however, so commonly grown in hot countries, and the cultivation being comparatively easy, that it is well worthy of inclusion here. The yield may vary from 25 to 100 fruits per plant averaging about 1 lb. each. It has been estimated that Algerian Chayotes can be produced profitably at 15 francs per 100 kilos; they realize on the Paris markets 30 to 50 francs per 100 kilos, 1½ cents per lb. retail in Porto Rico (Cook, *seq.* p. 21), and 3*d.* to 4*d.* each retail in London.

Ref.—"Chocho (*Sechium edule*)," in Kew Bull. Aug. 1887, pp. 6–9.——"The Cultivation and uses of the Chocho or Chayote (*Sechium edule*)," Turner, in Agric. Gaz. New S. Wales, iv. 1894, pp. 416–419.——"The Chayote: A Tropical Vegetable," Cook, U.S. Dept. of Agric. Div. of Botany, Bull. No. 28, 1901, pp. 1–31.——"Kultur und Vorwendung der Chayote (*Sechium edule*)," Koch, in Tropenpfl. xi. 1907, pp. 704–709.——"Le Chouchou," in L'Agric. prat. des pays chauds, vii. 1, 1907, pp. 5–16.——"Industrie de la Paille de Chouchou," l.c. pp. 127–136.

The cultivation of all the cucurbits here mentioned is more or less the same. They require rich, light soil, a hot climate, moderate rainfall, and are all well suited to growing under irrigation. Seeds may be raised in the ordinary way and planted out, or they may be sown two or three together in permanent positions, and thinned out as desired. A distance of 4 to 6 feet is usually sufficient, or each plant may be allowed from 20 to 30 sq. feet when trailing on the ground. In planting, the collar should always be raised above the level of the ground so that no water lodges near it, and for this reason they are usually planted on prepared mounds, both in the field and garden. It may be convenient to grow them on poles or trellis, but provided the fruits are kept off the ground they grow equally well as trailers. A few may require special treatment; Melons (*Cucumis Melo*), for instance, are pinched back or stopped on each fruit growth, but Water Melons (*Citrullus vulgaris*), Marrows, Pumpkins (*Cucurbita Pepo*) &c. are usually left to ramble freely, though an occasional thinning is required to prevent overcrowding. Cucumbers (*Cucumis sativus*) and Marrows, or those used as vegetables, are cut as they reach the desired size unless wanted to ripen for seed, or as in the case of the marrows, for preserving. Those used as fruits are allowed to ripen on the plant. All require plenty of moisture at the root and due care in watering is not the least essential to success.

Ref.—"Cucurbitaceous Fruits in Egypt," Brown, in Journ. Roy. Hort. Soc. xxxv. July, 1909, pp. 31–35; Abstract in Agric. News, Barbados, viii. 1909, pp. 308–309.

FICOIDEAE.

TRIANTHEMA, Linn.

Trianthema monogyna, *Linn.* ; Fl. Trop. Afr. II. p. 587.

Ill.—Lam. Encycl. t. 375 ; Ann. Sc. Nat. Paris, Series 3, xviii. (1852), t. 12 ; De Candolle, Pl. Grass. t. 109.

Katagum (Dalziel, No. 145, 1907, Herb. Kew) ; collected also at Cape Coast. Cosmopolitan in the tropics.

In India the leaves and stems are eaten when young as a vegetable, after being well boiled, though sometimes said to have poisonous effects, producing paralysis and diarrhœa (Dict. Econ. Prod. India ; Dymock, Pharmacog. Indica ii. p. 102), and various medicinal uses are attributed to the root (Dymock, l.c.).

Trianthema pentandra, *Linn.* ; Fl. Trop. Afr. II. p. 588.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 128 ; Lam. Encycl. t. 375, f. 2 ; Thonner, Blütenpfl. Afr. t. 44.

Katagum (Dalziel, No. 146, 1907, Herb. Kew) ; Borgu (Barter, No. 744) ; Kouka (Vogel, No. 52). Found also in Sierra Leone, Gambia, Nubia, Senaar, Kordofan, &c., occurring in India.

Used in the Sudan as a stomachic for men and cattle, and as a cure for gonorrhœa (Broun, Herb. Kew). In India eaten as a pot-herb in times of scarcity, though liable to produce diarrhœa and paralysis ; medicinally it is an astringent used in abdominal diseases (Dict. Econ. Prod. India).

MOLLUGO, Linn.

Mollugo Cerviana, *Seringe* ; Fl. Trop. Afr. II. p. 591.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 130 (*Pharnaceum Cerviana*) ; Lam. Encycl. t. 214, f. 1 (*Pharnaceum Cerviana*).

Katagum ; Yola ; Nupe. Widely distributed in Tropical Africa, from Senegambia to Mozambique and extends to the Cape, also in Asia, Australia and S. Europe.

Used as a medicine in fevers, India (Dict. Econ. Prod. India).

Found in dry river beds, Katagum and Yola (Dalziel, Herb. Kew) ; sand banks, Nupe (Barter, Herb. Kew).

Mollugo Spergula, *Linn.* ; Fl. Trop. Afr. II. p. 590.

Ill.—Rheede, Hort. Mal. x. t. 24 ; Burman, Thes. Zeyl. t. 7 (*Alsine erecta*, &c.) ; Burman, Fl. Indica, t. 5, f. 4.

Abeokuta ; Nupe. Found also in Senegambia, Sierra Leone, Congo, Angola, Zambesi and in Tropical Asia and Australia.

In India the juice is applied to itch and other skin diseases ; medicinally the plant is stomachic, aperient and antiseptic, and applied warm, moistened with castor oil, for ear-ache (Dymock, Pharmacog. Indica, ii. p. 103).

GISEKIA, Linn.

Gisekia pharnacioides, *Linn.* ; Fl. Trop. Afr. II. p. 593.

Ill.—Lam. Encycl. t. 221 ; Roxb. Pl. Corom. t. 183 ; Wight, Ic. Pl. Ind. Or. iv. t. 1167.

Sandy pot-herb.

Katagum ; Nupe. Widely distributed in Africa and India.

In India the leaves are used in the preparation of "dal," as a pot-herb in times of famine, or as a vegetable like the *Mollugos* ; various medicinal uses are attributed to the plant, aromatic, aperient and anthelmintic (Dict. Econ. Prod. India ; Dymock, Pharmacog. Indica, ii. p. 105).

ARALIACEAE.

CUSSONIA, Thunb.

Cussonia nigerica, *Hutchinson* in Kew Bull. 1910, p. 136.

A tree with corrugated bark and branches disposed more or less in an umbellate manner. Leaves crowded at the ends of the branches, long petiolate, digitately 6-foliate ; petiole 4–12 in. long, slender, glabrous ; leaflets sessile, oblanceolate or elliptic-lanceolate, caudate-acuminate, narrowed to the base, 2½–5½ in. long, ¾–2 in. broad, remotely repand-dentate, with the lower cuneate portion entire, glabrous, pale and closely reticulate below, with about 11–15 lateral nerves ; stipules adnate to the base of the petiole, ovate, acuminate, ciliate, about ½ in. long. Spikes crowded at the apex of the shoots, about 12 in. long ; axis gradually narrowed to the apex ; bracts ovate-triangular, acutely acuminate, at length reflexed, glabrous. Flowers not known. Fruits ellipsoid, slightly 4-ribbed, 3½ lin. long.

Vernac. names.—Takanda giwa (Hausa, *Dalziel*) ; Hanan Kuturu, or "Leper's Hand" (Yola, *Dalziel*).—Elephants sugar cane.

Kilba, Yola (Dalziel, No. 179, 1909, Herb. Kew).

Yields a clear, colourless gum, slightly irritant to the taste, not known to be collected by the natives (Dalziel, Kew Bull. 1910, p. 136).

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